POWER TOOLS AS A PASTIME

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John Christopher

(Of The Christophers—the best-known team
of do-it-yourself experts in Britain)

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For all
who want to save time, money and labour

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Foreword

. . . so I said to the publishers I am not going to write a heavy, stuffy technical-language book on power tools—I am going to write it so that it is easy to read and to understand. In the writing I shall treat the subject as it appeals to me, because power tools are very good friends of mine and this is going to be a friendly and helpful book.

It is going to be as valuably informative as I can possibly make it, and having written (with the collaboration of Rosemary, my wife) something like sixty books I think I know how to make my writing reflect my true feelings. There will be no soap-box forewords or introductions, and I have not the slightest intention of confusing my readers with expertise. For instance, if I write with awe upon the relative merits of thousands of r.p.m. (revolutions per minute for the sake of those who didn't know) of different makers' tools it will be because the information is important to the logical progression of the book—not because I want to bedazzle someone not as expert as myself. After more than fifteen years as a professional odd-job-man (if the producer of What's My Line reads this I'm available) I should have an affinity with the tools and materials which help me make a living as a do-it-yourself writer.

While we are on the subject of television appearances (my first nerve-shattering experience was at Alexandra Palace in 1949), I well remember the advertising-magazine programmes I did in the early days of commercial television. These were, as far as I am aware, the first *live* commercials ever broadcast in this country (if anybody writes to prove me wrong I shall simply tear up their letters), those previously transmitted in the

programme-series being filmed with my old friend the late W. P. Matthew, the original radio and television handyman. In the series I had to demonstrate two very well-known makes of electric drills, with their attachments, alternating the tools weekly. My permanent nightmare was that I should absent-mindedly demonstrate X's tool while extolling the virtues of Y's products; fortunately that never happened because I scribbled the name of the appropriate weekly tool all over the top of the demonstration work-bench.

But after the very first show in the series I received a very complimentary letter from my (now) good friend Frank Preston (they used to call him "poor old Frank" in those days—because of his work in another television programme—but I notice that that title has not been used so much since he's made such a wonderful success of editing one of the leading do-it-yourself magazines). Anyway, Frank Preston was most complimentary and so was the producer of the show who made some very kind remarks about my acting ability. Acting! I wasn't *acting;* the show went over well because I knew what I was talking about, and because I had confidence in the tools I was demonstrating. But I wasn't acting—I was dead serious.

Which reminds me not to forget the usual book "commercials" in this foreword with sincere acknowledgement of the very valuable assistance of the following in providing me with all the information and help I asked for, without which this book could not have been written: Black and Decker Limited, S. N. Bridges and Company Limited, Selecta Power Tools Limited, Wolf Electric Tools Limited. I would like to make another acknowledgement—an unusual one in the world of books—I would like to record my appreciation of the publisher's kindness and forbearance in giving me a free hand to write in my own way in an endeavour to make this book readable—I hope the sales will reflect their confidence in my ability.

On the subject of writing readable books I would like to show you some extracts of press reviews of a book on furniture making written by Rosemary and myself:

"*. . . the instructions are a model of clarity seldom found in books of this type*" (*Daily Worker*)

"*. . . a book which is easy to read*" (*Guardian Journal*)

"*John and Rosemary Christopher who are about the best-known do-it-yourself experts in Britain outline a new technique which should enable the most ham-fisted of unhandymen to learn to use tools effectively . . .*" (*Irish Times*)

"*. . . typifies The Christophers' lucid, sophisticated approach to do-it-yourselfery, too often written up in jargon both confusing and dreary . . . brilliantly presented*" (*Ideal Home*)

"*They begin on the assumption that the reader knows nothing and then lead him very carefully along a path to what must surely be certain success . . . it is my guess that you will have a lot of fun reading and acting upon it*" (*New Zealand Home Journal*)

"*The emphasis throughout is on simplicity*" (*Cape Times, South Africa*)

"*The text is clear . . . it is even fun to read*" (*New Homes*)

"*. . . this book has everything and is a pleasure to read*" (*Femina and Woman's Life, South Africa*)

"*. . . a remarkably thorough do-it-yourself book . . .*" (*Manchester Guardian*)

> *" There are no technical terms or puzzling references to the language of the trade. The authors speak in what they hope is the language of the average reader, and by their method what appears to be a complicated craft is broken down into a progressive sequence of simple actions. Many a thriller is a lot duller than this engrossing aid to the home-lover "* (*Ulster Herald Series*)

That's the bit I like best—many a thriller, etc. These extracts of *some* of the reviews of a book which we consider the most difficult we have ever written, will give you a very good idea of what to expect in POWER TOOLS AS A PASTIME.

This is clearly written in understandable language; it is a thorough, uncomplicated book on a subject of major-do-it-yourself importance. It is mainly intended for the inexpert power tooler, or would-be owner of power tools, but the expert power tool enthusiast will also find much in it of interest and value.

Good luck to you in your power tool future,

John Christopher

Bournemouth,
1960

CHAPTER I

Introduction to Power Tools

POWER TOOLS are comparatively new to handymen in this country and we can date their availability and growth of popularity roughly from about the end of the war. Before that there were very few power tools—as we know them now—in the hands of week-end do-it-yourselfers. Although I do remember a rather crafty uncle of mine running a work bench assembly consisting of grinding, buffing, drilling and turning gadgets from the back wheel of a very old motor-cycle; and several of the more adventurous handymen of the day rigged up some interesting (and sometimes electrifying) power workshops with the basic unit consisting of an old vacuum-cleaner motor.

After the war, when manufacturing conditions made it possible, the forerunners of our present-day power tools were produced and gained almost immediate popularity. Some of the earlier tools were nothing more than scaled down versions of industrial power tools; others were less robustly designed than they could have been—or at least they did not stand up to the excessive demands made upon them by the more ham-fisted of their users, despite manufacturers' stated limitations. But there always is the ham-fisted character and the tool-moron, who uses a screwdriver as a chisel and *vice versa.*

Some of the earlier models reflected the American influence, where—if we are to believe the glossy magazines—every handyman runs a super power-workshop. Be that as it may the valuable experience of American usage is reflected to advantage in some of the power tools now produced in this country which are the result of patient, thorough research

into the requirements of that sturdy product of recent years, the British do-it-yourselfer.

Our modern power tool is without doubt the best of its kind anywhere in the world, which if used intelligently and sensibly will undoubtedly be instrumental in saving its user money, time, trouble and labour on an almost endless variety of jobs about the house.

One of the main reasons for this is the keen competition among manufacturers in the power tool world, every one of whom is constantly using the full resources of their engineering technology, experience and capital to improve their products. This does not say, and does not mean that you should put off the business of buying a power tool because a better one may be produced next week, next month, or next year. The tools currently available are the best of their kind and any improvements that are likely to be made are not likely to radically change them in the same way, for example, that the design and performance of television sets may change over the next few years.

The keen competition which exists—which is keener than with any other do-it-yourself product—is a very good thing for the consumer, but it does make things rather difficult for the writer, who, if he has any sense at all, must make his writings unbiased. It is because of this that I have been most careful in refraining from recommending any particular manufacturer's products. Wherever you find trade names mentioned in this book they will be listed in alphabetical order. The power tool and accessories you wish to buy are entirely your own business, and I do not intend to influence you in any way.

* * *

Having got that off my chest, I think it would now be a good idea to define a power tool in the terms of reference covered by the scope of this book. As there are many makers

of power tools, so there are many, many kinds of power tools, In fact almost every piece of manufacturing machinery is a power tool of some kind or another. These of course are not within the compass of our interest and we can exclude from our consideration machinery and heavy duty industrial tools —riveters and so forth—also special power tools used in individual trades, such as power hammers and engineers' lathes. The concentration of interest in this book is upon portable electric tools of the handyman type which consist of the basic unit (an electric drill) together with its accessories and attachments.

It would be difficult in a book of this size to deal with every make, model and pattern of hand power tool. For the sake of clarity and to avoid confusing the reader the example tools upon which this book is based are the following four—one of each of the leading manufacturers' products:

Power Tool	*Brand Name*
The D500.	Black and Decker.
The Neonic Drill DR2T	Bridges.
Selectamatic	Selecta.
The Safetymaster.	Wolf.

Some manufacturers describe their tools as drills, others call them power units; basically they are all electric drills which may be regarded as power units, each one of which will drive a whole range of conversion attachments, to do an almost endless variety of jobs from mixing paint to preparing concrete, including buffing, grinding, polishing, sawing, planing (drilling of course), turning, sanding, jointing, and an almost incredible array of household jobs from polishing floors to cutting hedges.

But we are going ahead too quickly; let's leave purpose-attachments alone and take another look at the tools them-

selves (which hereafter will be referred to mainly as power units). There are other power units in addition to those mentioned above, some made by the same manufacturers; without wishing to turn this book into a catalogue of power tools, you will find other models mentioned in the appendices at the end of this book which also list accessories and attachments for each maker's tools.

At this early stage of progress we shall therefore only be concerned with the four power units mentioned—the D500, the Neonic Drill DR2T, the Selectamatic and the Safety-master. You will take it that the basic information provided in the following instructions is generally applicable to all kinds of power units—where this is not so I shall mention it.

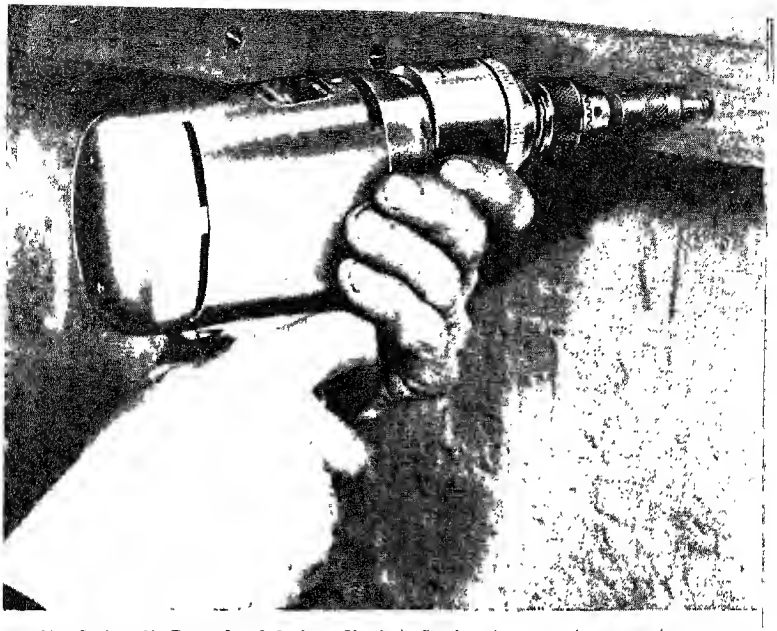
So we will go ahead with our four main (for the purpose of this book) power units—if you want something different—more powerful, less powerful, cheaper or prettier to look at, all you have to do is to consult your dealer, or write to the power tool manufacturers whose addresses you will find in the advertisement columns of do-it-yourself magazines.

Which brings us to another problem in writing a book of this kind—how to keep it up to date. At the time of writing, and each time the book is reprinted, the lists of tools, accessories and attachments are correct, but it is quite possible that new accessories and attachments will be added from time to time and when making a final choice it is advisable to consult the latest lists of the makers whose tool you intend to invest in, or already own.

* * *

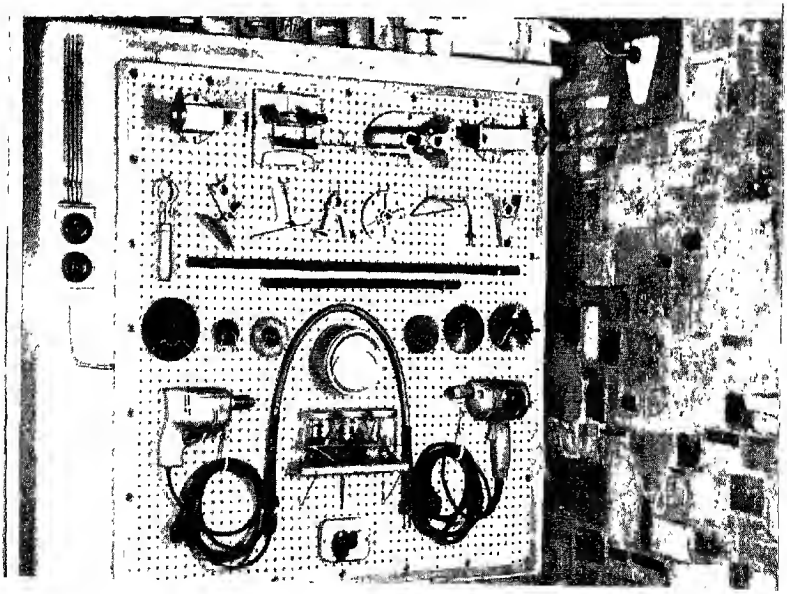
There is one other point which should be cleared up before plunging into the descriptions of power tools, their use, performances and maintenance—this is their portability—when is a portable tool not portable?

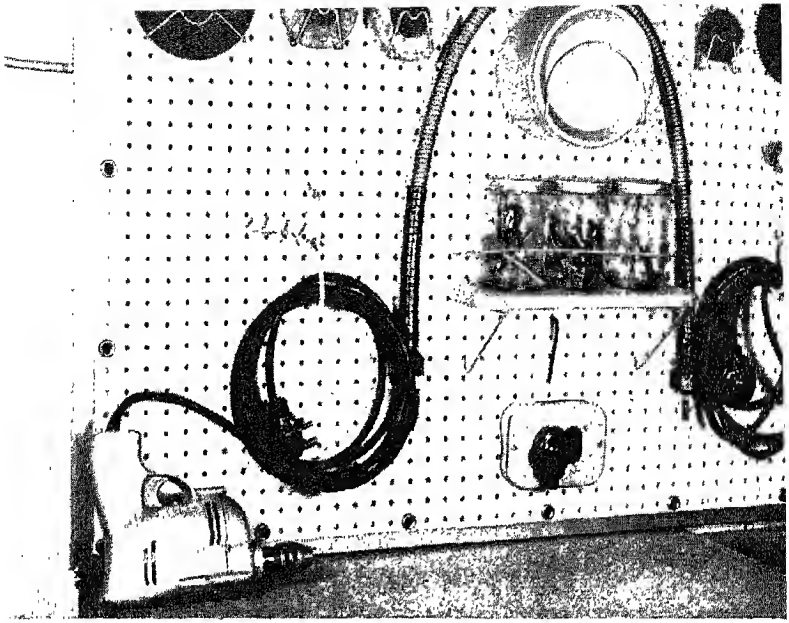
The same answer applies to all our four main power units.



The Bridges Nu Drive Speed Reducer Chuck is fitted with a screwdriver attachment which remains inactive until pressure is applied to the clutch

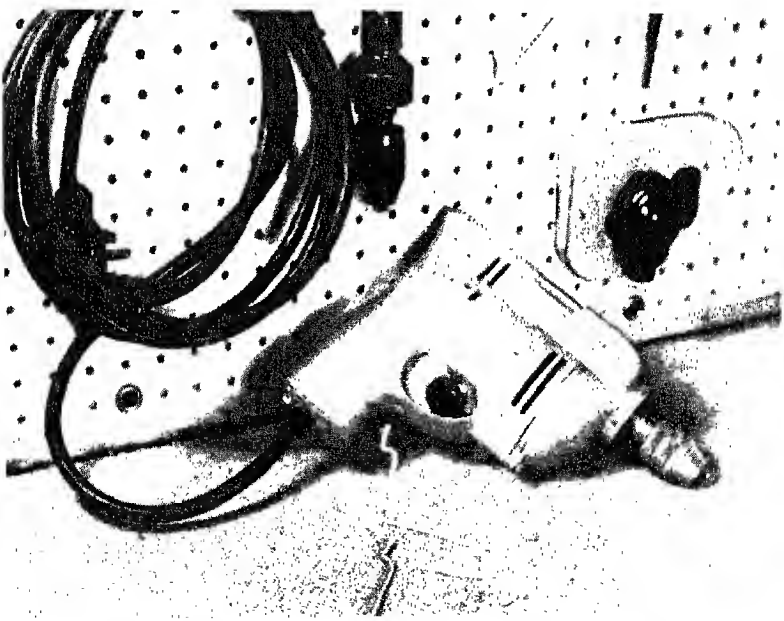
Power tool workshop rack.

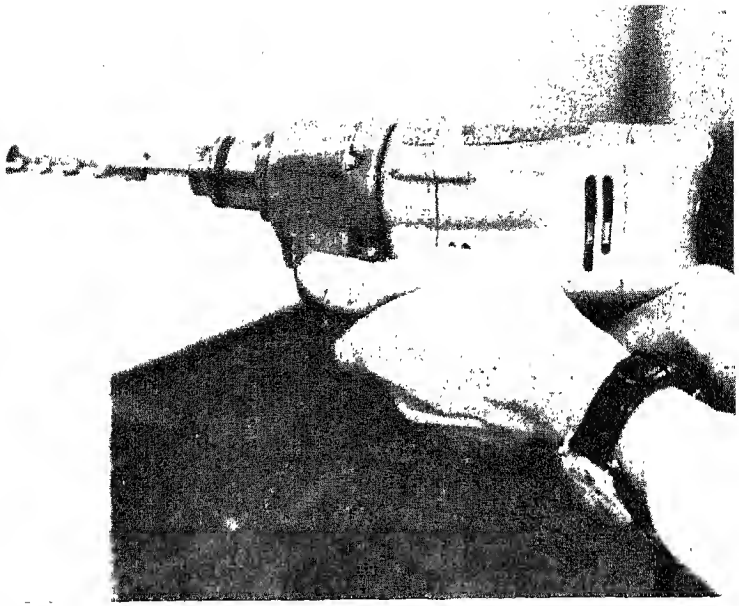




Corner of tool rack—note power point under jar shelf.

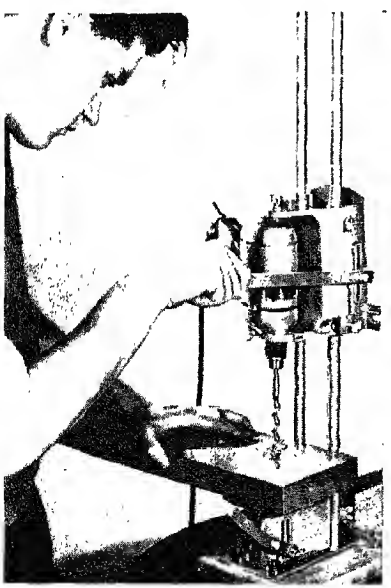
Example of wire fitment for racking power tool equipment on pegboard tool-rack.





The Wolf Cubmaster fitted with a reduction gear attachment—the chuck is loaded with a large diameter wood-bit.

Bridges "Neonic" Drill set up with bench stand for vertical drilling—chuck is loaded with a large-diameter wood-bit.



The Wolf Safetymaster Bench Drill stand in use—drill is fitted with reduction gear for large-diameter wood drilling.

Wolf Safetymaster with wire brush in use for derusting lawn mower

The Black and Decker Dyon in use with a speed changer—a handy attachment for drilling in awkward corners. Enables speed to be increased as well as reduced

Wolf Safetymaster with rubber backing disc covered with polishing mop-nole tool is fitted with Wolf Lo Speed reduction gear (dark piece at front—compare with above right)

These are portable when they are fitted with accessories and attachments which can be used with the tool held in the hands —*i.e.* when the chuck is loaded with a drill-bit, sanding disc or when it is attached to a portable sawing-attachment (or any other portable attachment). The power unit is considered not portable when it is fixed to a bench or table by means of a stand or holder when it becomes, for example, a lathe, a bench saw or a vertical bench drill, etc. It should of course be appreciated that a single unit may be adapted at will by means of changing the accessories or attachments to do any one of the multitude of jobs for which it is intended.

Which brings us to yet another point in sensible progression; make sure the job you want to do warrants changing the purpose of the power tool. For instance—to give a sledge-hammer example—if your power unit is rigged up as a vertical bench-drill, and you convert it into a bench-saw set-up to cut the end off a piece of 1 in. by 2 in. softwood you don't really need a modern time-saving workshop . . . . . you need a psychiatrist!

A little thought in planning your work will save even more time and trouble than the ownership of a power unit will most certainly ensure.

CHAPTER 2

Before Choosing a Power Tool

THE MOST SENSIBLE advice any do-it-yourself writer can give on the purchase of tools generally is *always buy the best you can afford.* Although that is true of general tools—a hammer, or a handsaw for instance—it is only partly true of power tools. The reason for this, as I have said before, is that the power tool manufacturing business is the most highly competitive in the range of do-it-yourself products. Whereas it is possible to buy a cheap, shoddy hammer, it is not as possible or likely that you will be able to find a cheap and shoddy power tool—at least not produced at this time by any of the manufacturers named in this book.

There must, therefore, be some other way of choosing a power tool (referring of course to the basic power unit—the electric drill). There is, of course, depending on its purpose. Extending the example of our hammers, if you wanted to purchase a light hammer for driving pins and small nails, you wouldn't dream of paying good money for a 20 oz. claw hammer. It follows logically, therefore (or almost), that the type of power tool you choose to buy should be related to the use to which you intend putting it. If you know that you will only use the tool for occasional light jobs it seems pointless investing in one of the more powerful units. But what you must understand right from the start is that every power unit has a performance maximum; whereas the powerful tool will do everything that the less-powerful tool will do, the smaller tool may not have the guts to do the heavier jobs.

So think carefully before you buy, buy wisely and be guided by the individual maker's advice on each tool's limitations. If

the maker says that one of his models will drill $\frac{1}{4}$ in. diam. holes in soft steel, don't expect it to drill $\frac{1}{2}$ in. holes in hard steel (even with a chuck adapter to take the larger size drill bit)—your reward will not be a neat $\frac{1}{2}$ in. hole, but the smell of scorched insulation as the motor burns out and grinds to a juddering halt.

Buy the tool you want, for the jobs you intend doing, and don't use it for other jobs beyond its performance capacity. You may rely upon it, that any of the four book example models described are capable of doing all the jobs within the scope and experience of the average handyman—and a bit more too.

But there are other considerations, apart from performance capacity, when choosing a tool—design, appearance, colour or just the feel; you may go for the tool which can be used safely from a two-point socket, or one embodying a neon tube which lights up to warn you when the tool is not electrically safe, or one which has two speeds, or one which has a left-handed grip.

There is yet another tool-selection aspect which is perhaps more general of hand tools—the feel of it. The craftsman buying a new tool—a hammer for instance—may want to see several apparently identical hammers, which he will in turn hold in his hand and swing, and he will surely choose a particular one, of those apparently identical hammers—the one which feels right in his hand. There is a great deal of difference of course, between power tools and hammers, but it is wise to choose the model which apart from all practical considerations of cost, etc. feels at home in your hand. So when you choose a power tool don't just look at it in the box; hold it in your hand, grip it, weigh it, get the feel of it and choose the model which seems right for you. That is not perhaps the most practical advice to offer in a book of this kind, but none-the-less it has some value in the selection of a tool—

you will never have complete confidence in, or be able to do your best work with, a tool that does not feel right in your hand.

The next point of consideration in choosing a power tool is an extension of what has been previously said—look ahead and buy the tool which will fit in best with your future intentions. In this case I refer to attachments and accessories. If this is your first approach to acquiring a power tool workshop, you may be under the impression that the fittings which convert the basic power unit (the drill) into a multi-purpose tool are interchangeable between different makes. But this is not so—or, at least, not completely so. Some accessories may be used in more than one power tool (make), but few of the attachments can be interchanged. To enlarge upon this; you may be able to use X's sanding disc with Y's power unit, but it's most unlikely that you can use Y's bench stand with X's power unit.

So before choosing the power unit itself study the maker's list of attachments and accessories to make certain that the purpose-attachments and accessories you are likely to want in the future are included in that particular maker's list. It is wise to stick to one family (maker) of tools and fitments. Which simply means that if your future will include such things as hedgecutting and polishing floors choose a tool with listed attachments for your purpose. Power tools are not grown-up toys, but more than one man has bought an electric drill either because the man-next-door has one, or because it looks like a gun and makes interesting noises. My son John Christopher (junior) is convinced that my power tools are nothing more than burp-guns for shooting electronic space Indians (from my blockhouse, cunningly disguised as a workshop) and no technical explanation I can give will persuade him that this is not so. But of course he is only three years old. There's no excuse for you—choose a good tool and one that is most suited to your present and future requirements.

The right tool is undoubtedly a good investment that will return good dividends in time, work and money saved.

Before describing our four book-example power units, let us stop for a moment and take another look at this business of accessories and attachments, and if you don't mind my parental example, we'll bring John Christopher junior into the picture again. He saves model cars, which we thought was a good idea until some thoughtless enemy of ours presented him with a catalogue of model cars. Of course he wants the lot, and every Saturday sees one more model ticked off in the catalogue and added to his set.

But as I said before, you are not a child. When your Saturday comes round you don't dash off and spend your pocket money on the next part of your " set " of tools—or will you? Some power tool manufacturers list accessories and attachments in sets which is a very good idea, and can be most helpful to the new boy. They say " there's no fool like an old one," and this old fool cheerfully admits that he was bitten by the set bug with the result that the power tool panel in my workshop holds some bits and pieces which I have never used, and probably never will. They also say that the man who never makes mistakes never makes anything, but you can profit from my mistake by thinking twice before you buy that set, make sure that you have a real need for every item.

There will always be the extra piece of equipment you need for your power tool workshop, and that is how it should be, but spend your money wisely, choose the best you can afford and only buy when there is a definite need for it. I try to follow a simple rule when considering the purchase of extra equipment for my workshop, photographic studio and office, it must really be necessary and it must really pay its way. A few years ago we held book agreements totalling almost 2,000,000 words and we invested in a tape-recorder which increased our average daily wordage output from 3,000 to 10,000, but we did not buy it because it is the fashionable

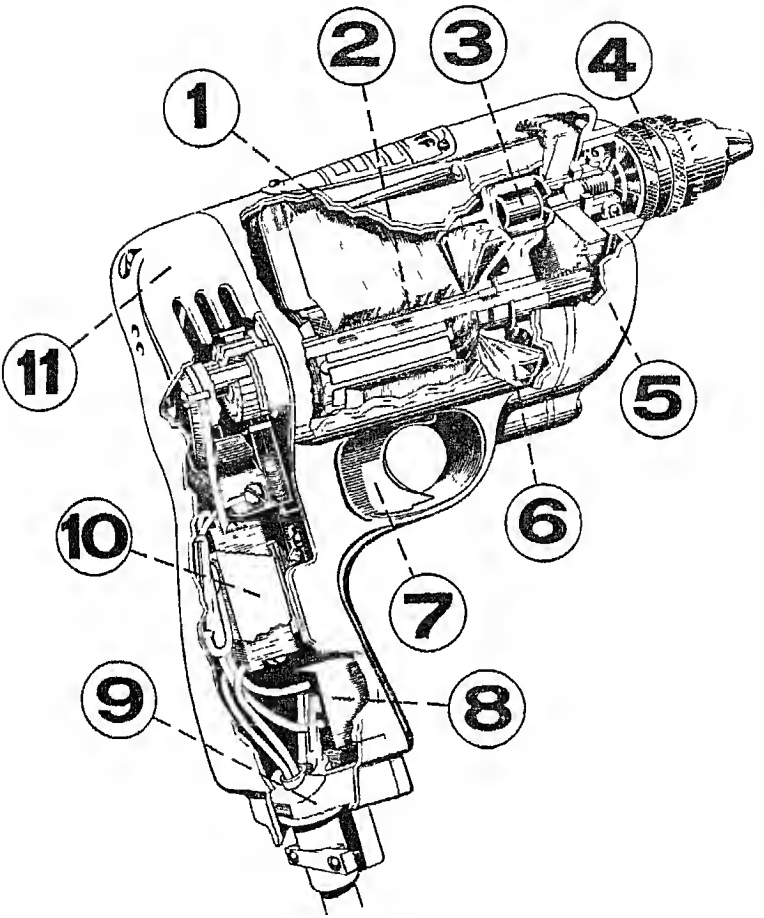


FIG. 1.—*The Wolf Safetymaster—main parts.* 1. Insulating case lining ensures that there is no electrical contact with the user should a fault occur. 2. Insulating sleeve between armature shaft and windings (the electric motor has no metallic contacts). 3. Bush bearing. 4. Five-sixteenth inch geared precision chuck. 5. Nickel chrome gears—high frequency hardened and tempered. 6. Insulated moulded ventilation fan. 7. Insulated moulded double-pole switch trigger. 8. Radio suppressor. 9. Insulated cable cleat. 10. Double-pole switch mechanism. 11. Specially toughened glass fibre insulated switch cover.

thing to do—it was an essential purchase. On the other hand in my photo-studio odd box I have no less than nine antinuous cable releases—eight more than I need simply because (mainly for lack of experience) I did not think far enough ahead.

So do make sure that the next piece of power tool equipment you want is really going to pay for itself. It will if you have enough for it to do. On the other hand, however, don't try to make a tool do a job for which it is not intended, especially when misuse may create a safety problem.

What I have said about interchangeability of attachments and accessories is generally true of most makes of power tools, but recently we have seen the introduction of accessories, etc. produced by manufacturers who do not produce power tools. These may be used when it is so stated with any make of tool the governing factor usually being the chuck capacity. Good examples of these extras are the Stanley " Swirlaway " (a flexible-jointed sanding attachment), and the " Simmonds Surform " drum-type planer and cutter attachment.

This book deals with power tools and their multi-purpose accessories and conversion attachments, but it is worthy of mention that the latest trend is toward purpose power tools—electrically powered tools for one purpose only. For instance if you do a lot of planing, you can buy a power planer which will plane like mad, but which of course cannot be converted into a concrete mixer or floor-polisher.

The purpose of this section is to make you stop and think before you spend your money—just that. You will find accessories and attachments listed in the appendices. The following section deals with power units.

Chapter 3

Makes and Models

I STARTED THIS BOOK with the fixed intention of not showing bias for or against any particular manfacturer's power tool. This section therefore, has been most carefully checked and rechecked to eliminate any suggestion of any one unit being better or worse than another. Not because I am afraid to say what I think—far from it—but the actual final choice must be yours, not mine. The reviews which follow, of the four example tools upon which this book is based are written as a result of practical experience and with the help of the maker's technical data.

Four power units are dealt with; others are mentioned in the appendices with details of attachments and accessories. The basic four are:

The D500—Black and Decker
The Neonic Drill DR2T—Bridges
Selectamatic—Selecta
The Safetymaster—Wolf

But before plunging into technicalities there is one point which I want to make clear—this concerns the r.p.m. (revolutions per minute) speed of power tools. The inexpert may consider that there is some advantage in choosing the fastest tool—so there may be for some jobs, it depends on the nature of the work you want your tool to do. But this feature should not necessarily be regarded as the ultimate deciding factor. Some jobs are better done with fewer r.p.m. for instance drilling masonry . . . whereas a slow-speed drill cannot be accelerated, a high-speed drill can be fitted with a reduction-gear

chuck-attachment, which without slowing down the motor will reduce the r.p.m. to suit the job in hand. These most useful attachments are described more fully elsewhere—back to our power units which are illustrated in the drawings or in the photographs showing the tools in use.

THE BLACK AND DECKER D500 (FIG. 4)

This is a robust, precision-engineered tool. A sturdy power pack designed to do about every job a portable power tool can do. An excellent range of attachments is available for turning, sawing, grinding, buffing, sanding, drilling and wire brushing, etc. (see also Appendix A). It may be used to power a well-designed floor-polisher, and also has an attachment for trimming hedges, and for pruning. Vital statistics are as follows:

Nett weight 3¼ lb.
Universal AC/DC motor
No-load speed of 2,600 r.p.m.
Drilling capacity (steel, brick, tile etc.) ¼ in.
Drilling capacity (hardwood) ½ in.
Voltages: supplied in 115, 220 and 240
Suppressed for radio and TV interference
Chuck capacity ¼ in.

The D500 is sensibly shaped and is well finished in duo-tone silver-gold. It has a three-jaw precision-geared chuck, a diamond-turned motor for smooth running and is nylon insulated for longer motor life. It has helical gears and a specially-developed ball thrust race. A stud at the side of the on/off pressure switch is used to lock the switch in the "on" position, an especially useful feature when the power unit is fitted with a bench attachment for work requiring two hands—bench-sawing for instance. The side handle can be unscrewed and replaced for left- or right-handed use.

The Black and Decker after sales service includes a User's

Advisory Service which provides Black and Decker owners with individual advice on using the tools and their accessories. Also there are Service Stations in different parts of the country for repairs and adjustments.

THE BRIDGES NEONIC DRILL DR2T (FIG. 2)

This is a power unit with a real punch which has been designed for maximum adaptability and versatility with the maker's Home Workshop equipment which includes attachments for grinding, polishing, turning, sanding, buffing and sawing. Extra attachments are obtainable for chisel-mortising, comb-jointing, hedge-trimming, grass-cutting and paint-spraying etc. A list of attachments appears in Appendix B at the end of this book. The specification is as follows:

Nett weight 4 lb. 1 oz.
No-load speed 2,950 r.p.m.
Full-load speed 1,600 r.p.m.
Drilling capacity (steel) $\frac{1}{4}$ in.
Drilling capacity (hardwood) $\frac{3}{4}$ in.
Voltages: supplied in 110, 200/220 and 230/250
(also 24 v. or 50 v. motors on request)
Suppressed for radio and TV interference
Chuck capacity $\frac{1}{4}$ in.
Rating (power) 325 watts.

The Bridges Neonic Drill DR2T is a wonderfully powerful power unit, fitted with an exclusive cartridge motor unit which really packs a punch. It is fitted with an engineer's geared chuck, has ball-bearings throughout and incorporates an ingenious Neonic Safety Eye. This is a neon tube which is set in the top of the body which automatically gives warning of unsafe or inefficient working conditions—for instance, faulty workshop wiring. The DR2T has helical gears, and an on/off locking stud is positioned near the pressure switch in the handle. It has a sensible body shape and is very well finished.

THE SELECTA SELECTAMATIC DRILL (FIG. 3)

A powerful drill with a wide operational range. A good-looking tool with a comfortable hand-grip. Supplies the motive-power for the "Benchmaster" workshop equipment which is of extremely robust and versatile manufacture. May also be used to power the Selecta "Home-master" workshop equipment, which with its attachments may be used for sanding, grinding, polishing, buffing and drilling etc., also for planing, turning, sawing, jointing and routing etc. A list of attachments and equipment is given in Appendix C at the end of this book. Selectamatic specification is as follows:

Top speed 4,500 r.p.m.
Low speed 2,500 r.p.m.
Chuck capacity $\frac{3}{8}$ in.
Voltages: Supplied in standard voltages
Suppressed for radio and TV interference
Rating (power) 450 watts.

The Selectamatic has a large chuck capacity. It is a good-looking, well-balanced tool. Has engineer's chuck, helical gears, a cartridge-type motor and roller-and-needle bearings. A locking device is incorporated in the on/off switch. The chief feature of the Selectamatic is the speed-change, which is controlled with a speed-change bush set under the front of the body. This can be set to slow or fast speed as required.

THE WOLF SAFETYMASTER (FIG. 1)

A tool of good quality, of robust construction, good design and satisfying performance. It provides a power unit for driving a very wide range of attachments for drilling, buffing, grinding, polishing, sanding and sawing etc., also for jointing, grooving, turning, and for weeding, removing paint, trimming hedges and mixing concrete etc. A list of accessories and attachments is given in Appendix D, at the end of this book. Specification details are as under:

Nett weight 3 lb. 13 oz.
Speed (running light) 3,600 r.p.m.
Speed (on full load) 2,400 r.p.m.
Drilling capacity (Hardwood) $\frac{5}{8}$ in.
Voltages: Supplied for operation on all standard voltages—DC and single phase AC 25/60 cycles (also available for 32 and 50 volt supplied to special order)
Suppressed for radio and TV interference
Chuck capacity 5/16 in.
Rating (power) 325 watts (full load).

The Wolf Safetymaster is a good-looking power tool which is precision made and attractively finished. The pressure switch is fitted with a locking "on" position; it has high-quality nickel-chrome gears. Bearings are ball for the chuck spindle—needle-roller for the commutator end of the armature shaft. The chief feature of the Safetymaster is the double insulation which dispenses with the earth wire—the tool can be used from a two-pin plug with perfect safety. A reliable and hard-working power tool.

GENERAL INFORMATION

As I have already mentioned the four power unit, electric-drills described above have been selected to keep this book within reasonable bounds and to simplify the approach to power units and electric tools, some of the single-purpose type and those considered of interest to the handyman are included in the appendices at the end of this book.

Before clearing up points arising from the ownership of electrical power units, as motive forces for a wide variety of attachments, let us re-examine some of the facts given above with a view to clarifying what may seem puzzling to those completely new to power tools.

Speed. As I mentioned in the first part of this section the r.p.m. (revolutions per minute) should not be regarded as the

final deciding factor when choosing between one power unit and another. It depends on what you want from your unit in the way of performance related to the type of work you intend doing with it. For some purposes high speed is an advantage, for others it is better to run at a lower speed. Generally it may be accepted that very hard or very soft materials are best drilled at slower speeds—I say generally because there may be some exceptions, and there may be alternative methods. Let us say that you want to drill a hole in a piece of steel; if you use an ordinary drill bit at high speed it will wear out drilling the first hole, but it is possible to obtain high-speed drill bits which are specially made to work at high speeds and my own use of these has been most satisfactory (I shall have more to say about drilling in a later section).

Keep it firmly in mind that it is possible to reduce the speed of a drill—not the motor, but the chuck-speed—by fitting a speed reducing attachment, and I shall have more to say about these very useful pieces of equipment later in this section.

Drilling Capacity. Figures are given in the reviews above, but they require some further explanation. In each case above, the drilling capacity referred to is one of diametric width, not depth. If the drilling capacity is given as $\frac{1}{4}$ in. that will be the diameter of the hole drilled through any thickness of material. It is important to appreciate the use of the word *capacity* which means exactly what it says and no power tool should be *forced* to exceed its capacity or limitations.

Chuck Capacity. This is of course directly related to the drilling capacity and is the diameter of the thickest drill (or attachment piece) which can be inserted between the jaws of the chuck and it will be found that the chuck capacity is equal to the drilling capacity of the hardest material—where chuck capacity is given as quarter-inch the hard drilling capacity is also $\frac{1}{4}$ in.

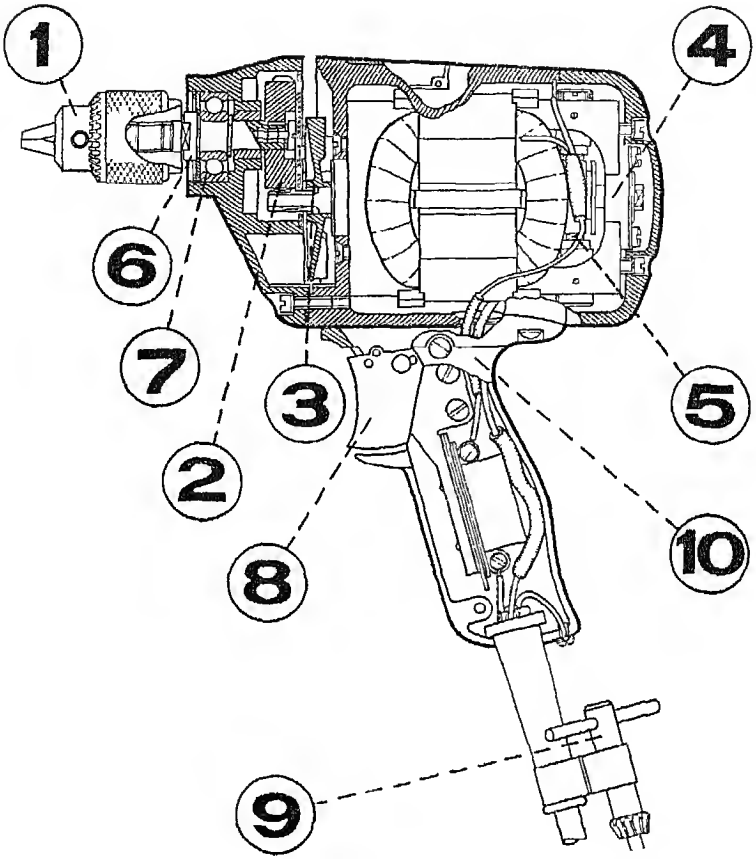


FIG. 2.—*The Bridges Neonic Drill DR2T—main parts.* 1 Chuck. 2. Large gear. 3. Armature fan. 4. Motor unit. 5. Carbon brush. 6. Chuck spindle. 7. Front gear box bearing. 8. Switch trigger. 9. Chuck key. 10. Handle cover casting.

Voltages. It may be accepted that all the leading manufacturers produce tools which feed from standard AC/DC power supplies as regards the number of volts supplied, and that by arrangement (which means by placing a special order) tools can be obtained rated for sub-standard service-supplies. Also in these cases of low-voltage supplies it is possible to obtain a transformer to transform whatever voltage you have into whatever voltage you want.

A word of caution here, make absolutely certain of your supply voltage. I live in a town where houses on one side of the road in one of the districts are serviced with a supply of 200 volts; houses on the other side of the road are fed with a supply of 210 volts. While a slightly lower supply voltage will not harm your equipment, a higher voltage supply may cause some damage. Usually there is some latitude in the voltage-rating of all electrical appliances—those bearing a plate engraved 200/220 may be safely used with stated-meter voltages of supplies between that range. All power tools are marked with supply-voltage figures. You will find your own supply-voltage stamped into a plate affixed to your electricity supply meter.

Rating (power). These figures refer to the consumption of the electric tool. They are given in watts. As you know, a unit of electricity is the amount consumed by a 1,000 watt appliance in one hour (or by a 2,000 watt appliance in half an hour). Therefore if your drill is rated at 325 watts it will run for just over three hours before consuming one unit of electricity.

Don't bother to check your brand new drill by using it for three hours against a clock and an electric meter. Long before the time is up you will in all probability notice some interesting trails of blue smoke emerging from the ventilation slots, which, accompanied by a scorching paint/rubber odour, will indicate that the electric motor of your drill is burning out.

Taking the 325 watt power rating as an example and saying that a unit of electricity cost 1d. (this is an example figure—don't send me your bills) the cost of running your power unit will be approximately one-third of a penny. Which is not bad at all for the service you can expect to enjoy from ownership of a properly used power tool.

Ventilation. Only one of the manufacturers of the tools reviewed above makes a special point of mentioning ventilation. All power units are air cooled. If you look at the exploded drawings of tools which accompany this section you will see they have an internal fan just in front of the motor. This revolves at the same speed as the motor—before it is geared down to the chuck spindle—and so directs a cooling flow of air over the motor. The air is drawn in through slots cut in the case of the tool. What is necessary to appreciate from this is that the ventilation slots should be kept clean and clear. In use the tool should never be held by the body-casing in such a way that the vents are covered by the hands, or the air supply to the fan may be restricted.

Suppressors. The makers' power units mentioned in this section are all suppressed for radio and television interference and may be safely used during periods of programme transmissions without making a mess of your neighbours' pictures or sound reception.

Leads. You have to search the small print in makers' literature to find much information on leads. But of course, every power tool is supplied with a lead connected to the tool with free ends for connection to plug terminals. In most cases power appliances are supplied without plugs which you must buy and fix yourself. It is of the utmost importance that the lead wires are correctly connected to appropriate plug terminals. The lead wires are marked; for three-pin plugs the red wire should be connected to the terminal marked "L" the

black wire to the terminal marked "N" and the green wire (earth) connected to the terminal marked "E."

Lengths of leads vary from 5 ft. to 6 ft. Extension leads are obtainable so that tools may be used at good distances away from power points; but a word of warning here—it is essential that the correct type of extension plugs are used, especially for three-core cable—don't cut the hedge with an extension lead consisting of odd lengths of flex attached with paper-clips.

Chuck Keys. These of course are supplied with power units as part of the tool. All the units described have three-jawed chucks, the jaws being released or tightened by turning a cogged chuck key in a seating hole in the side of the front of the chuck. The cogs of the chuck key engage in the cogs of the chuck itself (see drawings).

Guarantees. I am not going to compare listed makers' guarantees; they all seem very fair to me, but I would like to remark on guarantees in general as applicable to all tools and appliances.

A short while ago I asked the Managing Director of one of the largest hand-tool manufacturing concerns why his firm's tools were not guaranteed, and he told me that the firm's name and reputation were its guarantee. While no reputable manufacturer sets out to make tools (or any other product) which is faulty, it does sometimes happen that a faulty tool slips past the inspectors. Should any user purchase a tool which does not perform as it should it is automatically replaced provided it has not been mishandled.

If you are wondering what this is leading up to I would like to point out that although all power units are guaranteed, in most cases the attachments are not. But you may rest assured that any manufacturer jealous of his good name and reputation will exchange or replace a faulty product, always provided it has not been mishandled.

SAFETY

The idea of double insulation is a good one, so is the neonic eye which indicates danger—referring of course to the possibility of electric shock—and of course the third (earth) wire of a three-core lead is an essential in making power tools safe—but there's always the manual-moron who cuts through the lead with a hedge-trimming attachment or saw attachment, or pokes around inside the drill with a screwdriver to see how it works, and *perhaps* defeats all the maker's efforts to make his tools safe—electrically safe that is.

I have a do-it-yourself friend who goes through a very interesting (and amusing) routine every time he uses his electric drill. It goes like this; the tool is unplugged, switched on—and the pressure switch is locked in the " on " position. The plug is then inserted in its socket and the supply is switched on. This is done without handling the tool—the next bit really " sends " me. My friend warily sneaks up on the tool, licks one finger and quickly taps at the body of the tool. If he is not dead my friend can then use the tool—whether it's really safe or not. Apparently the point of this electronic-age superstition—that's all it is—is that my friend is not quite certain that his supply hook-up from house to workshop has not reversed the polarity of the supply, or reduced the efficiency of the earth.

It seems reasonable to me that the makers of power tools would not be very good business men if they sent out tools which would kill their customers off. In fact I know that every power tool, whatever the maker, is very stringently checked before leaving the factory. The makers assume—quite rightly so—that users will have the good sense not to poke round inside tools with screwdrivers, or remove safety devices from attachments. The rest is up to you, the user.

The makers cannot on your behalf be assured of the safety of your circuit wiring. Without wishing to be an alarmist, I have in my own experience known of three point supply

sockets in which the largest pin-hole is completely useless, not having been connected to "earth" or having been so badly connected that it is virtually useless. Reversion of polarity is quite common, although the double pole-switch of electric drills negates this danger.

To simplify the explanation without being too technical an electric supply from meter to appliance is fed through two wires—one has a black coverage, the other red. The red is the feed wire ("L" for live), the black is the return ("N" for neutral) wire. It is always the red (live) wire into which a switch is inserted so that when the supply is switched off it is the live wire which is broken with the switch, not the neutral return wire. If polarity is reversed—which often happens where unprofessional extensions to the circuit have been made—the socket switch in use will cut the neutral return wire, and the appliance will still be live (although it may not function) since the current is cut after it leaves the appliance and not before it reaches it. As I have already said double pole switches in electric drills cut the power in both the live (input) and the neutral (return) wire.

For general reasons of safety, and not referring specifically to power tools, if you have any doubts at all about the efficiency of your supply "earth" or continuity of polarity throughout the circuit make certain by having the system checked. This will be quite easy to do; your local Electricity Board will send an inspector on request—the cost and trouble involved are very small indeed. Should there be a fault, you will not be ordered to put it right as a matter of enforcement, but you will be told what is wrong to enable you to have it put right as a matter of personal choice. This does not refer to new houses where inspectors will not connect the circuit to the mains supply if there is a wiring fault.

There is another safety factor which should be mentioned, and do let me assure you that I have not a bee in my bonnet concerning tool-safety. A short while ago I wrote an article

for a popular man's magazine, on the subject of power tools; following publication one of the leading manufacturers wrote to me suggesting that my remarks on safe usage were over emphasised, and that I was wrong in making a crack of " cutting your nose off to spite your face." I was referring of course to tool-users who remove safeguards and wear dangling neckties. I leave it to you to imagine what could happen, if the end of a dangling necktie gets caught up in a tool spindle with a powerful motor driving it at X,ooo revs. per minute. I strongly suggest that you do not wear loose clothing which may become caught up in the moving parts of your power tool set-up; cuffs should be buttoned or sleeves rolled up.

I have never yet—touch wood—had an accident with a power tool or suffered electric shock, but I would like to tell you about an interesting experience of mine. One damp and foggy February I went into my workshop, took the electric drill from the rack, loaded the chuck, plugged in the lead and switched on. The result was not the smooth purr of a powerful tool, but a blue flash and a rifle-like crack from the fuse box. Incidentally, my workshop has its own fuse box separate from the house-circuit fuses. Apart from a very slight tingle I suffered no shock because I've made doubly sure that my wiring is safe—the tool was properly earthed. Why did it blow the fuse? . . . simply because the workshop air was loaded with damp particles which of course had crept inside the tool. The lesson is clear; store your power unit in a dry place.

As far as I am concerned power tools are safe tools, provided they are used sensibly *and are treated with respect.* If I have been guilty of the over-emphasis of possible dangers in this section it may well be that I have done you a service—a power tool is as safe as any other handyman tool if it's used properly. What, for example could be less dangerous than a hammer—who should know better than I? It takes three

months for a mashed (hit with a hammer) thumb-nail to grow again.

SPEED REDUCERS

These of course are really attachments except when the unit has a built-in speed reduction, even then a speed reducer may be fitted. It does seem to me that this section on the power units themselves is the best place to describe these very useful pieces of equipment rather than in later sections devoted to attachments.

The purpose of a speed reducer is of course to reduce the chuck-spindle speed where it is necessary to do so in some classes of work—a good example is drilling a brick wall with a tungsten-carbide tipped drill which performs best at slower than most drill speeds. Please notice that I said *chuck-spindle* speed, not *motor* speed which in terms of r.p.m. is very much faster than *chuck-spindle* r.p.m. If you look at the sectional illustrations of power tools you will see that (at the front of the tool, inside) each powerful motor is geared *down*, the motor spindle gear-grooves being much smaller than the geared wheel actuating the chuck-spindle (just inside the front body of the tool). It follows therefore that speed reducer attachments do not reduce motor speed but chuck-spindle speed.

Some speed reducers, or reduction-gear attachments as they are more correctly called, fit into existing chucks and incorporate a second chuck. A good example of this type of reduction gear is shown in Fig. 5. This is the Mason Master "Safe-D-Speeder" 4-1 reduction gear. The 4-1 figure is the reduction ratio; a drill with a full-load speed of 1,600 r.p.m., with this attachment fitted, has an output full-load speed of 400 r.p.m. which is quite a reasonable speed for drilling masonry, for example, with a slow speed drill-bit. The latest Mason-Master speed-reducer has a ratio of 12-1.

Another type of reduction gear-attachment is illustrated in

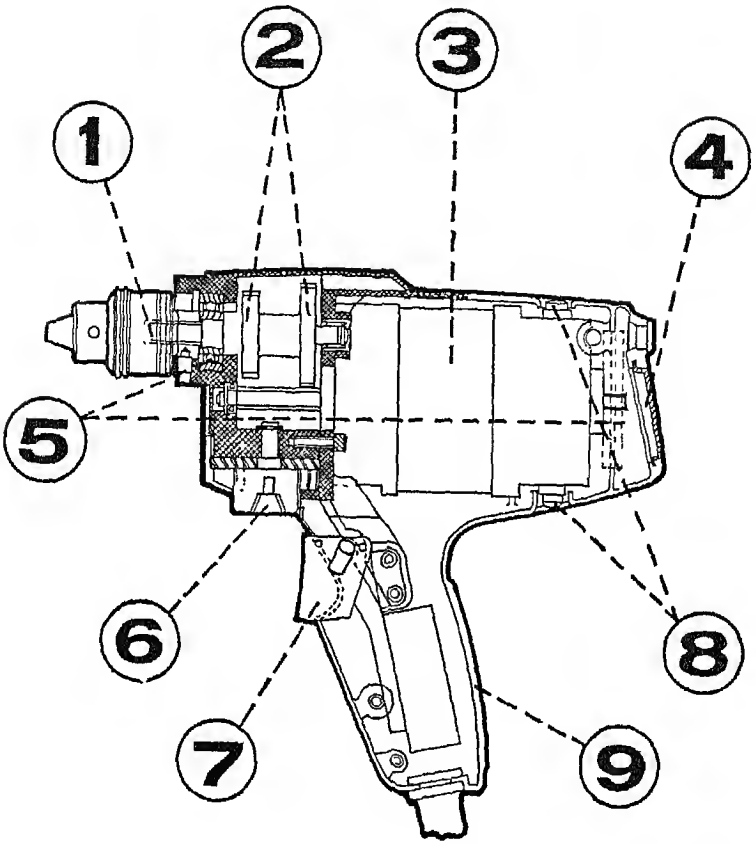


FIG. 3.—*The Selectamatic Drill—main parts.* 1. Three-jaw engineers' type chuck. 2. Helical gears. 3. Cartridge-type motor. 4. Multi-louvre ventilation. 5. Front and rear bearings. 6. Speed-change bush (fast or slow). 7. Pressure squeeze switch. 8. Extended depth brushes. 9. Hand grip.

Photo One. This is the Bridges (two-speed) "Nu-Drive Attachment" which is shown fitted to the Bridges Neonic Drill DR2T. It is fitted by removing the drill chuck from the front of the drill, connecting the reduction-gear attachment and replacing the drill-chuck on the front of the attachment. Full instructions for attachment and use are provided in the manufacturer's leaflet supplied with the "Nu-Drive Attachment." This information applies generally to all attachments—the manufacturers supply fitting and use instructions with each attachment.

The "Nu-Drive Attachment" is of robust design and construction. The reduction-gear attachment gives the user finger-tip selection of two working speeds thus enabling him to drill efficiently a variety of materials including ferrous and non-ferrous metals, masonry, tiles, wood and plastics. It should of course be appreciated that drilling some plastics at high speed will burn (or melt) the material because of friction heat—a case of more speed less haste!

The two gear-ratios are 1-1 and 3-1. 1-1 is, of course, the normal r.p.m. speed of the drill and there is little need to remove the attachment once it is fitted. The 3-1 ratio reduces the full drill speed to one-third (approximately), the actual performance figure being a reduction to 980 r.p.m. from 2,950 r.p.m., the full drill speed. The examples used for slow-speed operation are drilling steel and hardwood, masonry drilling with tipped gears, tank-cutting with holesaws or tank cutters, also countersinking, reaming and sanding without scorching.

The gear speed is changed simply by turning a small gear-change knob fitted into the body of the attachment.

The Wolf reduction-gear is shown in Photos Five and Seven; more details will be given later.

The Black and Decker speed changer is illustrated in Photo Eight. This attachment may be adjusted to *increase* chuck speed, as well as reducing it.

Chapter 4

Your Power Tool—How it Works and How to Look After it

I HAVE a technical library of well over fifteen-hundred books and an enquiring mind to match. In none of my hundreds of books could I find an understandable description (in terms of beginner simplicity) of how an electric power unit works—not necessarily one motivating an electric drill. It seems to me that this knowledge is important; it is said, quite rightly so, that the motorist who knows what goes on under the bonnet is a better driver (or should be) than the chap who doesn't know the difference between a carburettor and a monkey-wrench. In my book the power tooler who knows what happens (in terms of conversion of electricity into chuck-spindle r.p.m.) inside the unit when he squeezes the trigger-switch is likely to be a better user (in appreciating possibilities *and* limitations) than the man who wonders vaguely if the blue sparks seen through the body-casing vents mean anything or not.

Remembering my uncle with the antiquated motor-cycle-cum-power unit, my friend who spits on his finger before flicking the drill and an acquaintance who stuffs the lead up his jumper (which, as I shall explain later, is not so silly as it sounds), I intend reducing the explanation to understandable simplicity of expression—this with the assistance of the drawing in Fig. 6.

Readers who already know what drives an electric motor can skip the next few pages; those who do not know what

happens inside the casing may benefit from reading the following de-technicalised explanation.

In 1831 Michael Faraday discovered that if a metal disc was placed edgeways between the poles of a horseshoe magnet and rotated on a shaft (Fig. 6a) an electric current would be generated and such an assembly is called a generator, the disc being turned by mechanical power to produce a flow of electrical current.

If the process is reversed and the magnet is electrically charged the disc on its shaft will turn until it is flat between the opposite poles of the magnet; thus we have the principle of movement in an electric motor, where the metal conductor (disc) is attracted to the opposite poles of the magnet, the shaft mounted conductor making a quarter turn due to the pull of the flow of current through the poles of the magnet.

But of course, a quarter turn is not sufficient, and continuing magnetic attraction to the conductor is attained by increasing the number of magnetic poles and the number of conductors. This is shown in Fig. 6 (B) where we see two conductors (discs in A) on a shaft mounted between two magnets each with a north and south pole—this is known as the magnetic field. If the magnetic field in (B) is charged with an electric current the conductors will again move and turn the shaft. But they will still only move through a quarter of a circle, although there may be some wobble at the end of the movement due to centrifugal force as the weight of the turning shaft tries to force its way past the attraction of the magnetic poles.

This jerk-movement of a quarter turn is transformed into continuous movement by reversing the polarity of the magnets from north to south, repeating at exactly the right moment when the pull of centrifugal force tries to move the conductors and shaft past the opposing pulls of the magnetic force. The method of reversing the polarity is shown in Fig. 6 (C). In this illustration the conductor and shaft with a core become

the armature with windings which end in a series of strips of metal which collectively are called the commutator, which is brought to press against a fixed brush. The action of the revolving commutator against the brushes (there are more than one) reverses the pull of the magnetic field at exactly the right moment when the conductors (plus the centrifugal force) are passing between the magnetic poles. Thus (as in B) the conductors are continuously attracted by the poles and turn full circle, the action being carefully timed to produce continuous movement until the supply is switched off.

This description has been very greatly simplified and described in this way the movement of the turning shaft appears slow; actually it is very fast indeed and the armature shaft moves at a terrific speed—so fast that it is necessary to cool it. Which brings us to the business (output) end of the shaft which as you will see in (D) is fitted with a fan.

The shaft is mounted on bearings and the front of the shaft is cut with a series of grooves which coincide with the cogs of the gear wheel. Note that the revolutions of the speeding motor are geared down—although the r.p.m. of the geared wheel is slower than the r.p.m. (approximately eight times slower—with some possible difference between various makes) of the armature shaft the strength of the power is increased. The chuck spindle extends beyond the gear wheel to project at the business end of the tool.

This explanation does not concern itself with anything else but the very simple facts; descriptions of coil-windings, phases, cycles, stators, rotors and induction principles, etc., are best left to books on electric motors; I am only concerned at this stage with a simplified explanation of the facts for those who do not know what happens between pressing the switch of a power tool and the chuck revolving at thousands of revolutions per minute. Faraday's principle is still valid, but well over a century of experience and experiment and ingenuity

have gone into packing a powerful electric-motor into the body of your modern power tool.

MAINTENANCE

Those without special knowledge of maintaining electric equipment will be well advised not to remove sections of power tool casings to clean or adjust the innards. Those with expert knowledge will not be in need of this advice.

The first essential is to keep your power unit in a dry place and to store it in such a way that it is not likely to become damaged—this simply means that you should keep your tool in a special box or drawer—or rack-stored where there are no other tools in close proximity. If you shove the unit away in a drawer which contains other tools it might become damaged —a wood chisel in the same drawer could cut through the lead insulation; a small screwdriver (or loose nail) could wriggle its way through a ventilation slot to damage motor, fan or interior wiring. A suggested method of racking your power tool and attachments is described in the next section.

One thing that every power tool owner can do is to keep an ever-watchful eye on the lead-covering insulation. Make a special point of checking this at regular intervals; go over leads inch-by-inch to check for small cuts or deep scratches which may creep larger to expose the core wires. Weak spots in the connecting lead are the extreme ends—where the lead connects to the plug and where it connects with the body of the tool. Constant use may cause lead-covering insulation to wear. As soon as you notice running splits do something about them.

The lead at the plug end can be shortened and rewired to the plug terminals—make sure that the wires are correctly connected, red to "L" pin, black to "N" pin and green to "E" pin. Leads may also be shortened to deal with split or worn coverings at the tool end, but if you do not understand electricity take the tool to a dealer who does repairs to

electrical appliances. Be sensible about this repair by shortening method—if overdone it will obviously restrict the distance at which the tool can be used from the plug-socket. Also, keep a wary eye open for perished lead-coverings.

With most electric power tools it is possible to remove a small section of the body-casing around the pressure switch by removing the appropriate holding screws. The object of this is to dust the switch points; removal of this section also permits loose lead terminal nuts (or screws) to be tightened, which is quite a simple job. But again, if your knowledge of things electrically-mechanical is sketchy, leave well alone and have the job done by one of the manufacturer's service agents. Dusting is done with a soft brush, not too vigorously to disturb the interior wirings. Always keep the ventilation slots clear and dusted. *Always remove the lead plug before carrying out any form of maintenance.*

Power tool motors have self-lubricating bearings (if this is not so the maker's instructions supplied with each tool will say which parts should be oiled or greased), and it is not advisable to pump oil indiscriminately onto moving parts—to do so could be harmful.

The front casing of power tools is removable by releasing the appropriate screws, and it is necessary to do so with some conversion attachments which are driven directly from the chuck-spindle, the chuck being removed with the body-casing. Directions for such removal are given with manufacturers' instructions supplied with power tools. Upon removal it will be found that the back of the frontpiece is packed with grease; should the grease become fouled with dust or swarf it will be necessary to renew it. This is done by removing the old grease, washing out the casing with paraffin and refilling with new grease of a type recommended by the individual manufacturer.

In all cases of lubrication the maker's instructions should be read carefully. Most attachments require lubricating with

oil where there are moving parts. This also is indicated in sales instruction-leaflets.

Warning of possible damage through misuse. All power tools have a built-in warning system—not because of ingenious forethought on the part of the manufacturers (excepting the neonic-eye principle) but because of the nature of their construction, the warning is a change of the noise a power tool makes when in use.

When a power tool is switched on for use the motor and moving parts emit a low-pitched, gentle humming, which we will call an idling hum. When the tool is brought into use the motor, through the gears, is subject to whatever resistance is brought to bear by the particular attachment in use—this whether it is drilling, grinding, buffing, sawing or any other functional purpose—and the pitch-noise of the working parts increases in tone to a continuous whine. This is quite recognisable as the musical noise of an efficient piece of machinery in action. When the tool is overloaded—that is when undue pressure is placed upon it—it will signal its disapproval with an angry scream; this note is quite unmistakable. In some cases the chuck-spindle may stop revolving, but the motor will still give out a noise like an angry swarm of bees and the coil windings will begin to smoke as they overheat and commence melting their insulation. *These are the built-in warnings, once heard they cannot be mistaken with the usual movement tone of the working parts.*

Just as a motorist relies upon sound to judge engine performance and load, so can you use your ears when using your power tool to ensure that it is never forced beyond its capacity. It is not necessary for me to describe the actual change of pitch (even if I could in writing); you may rest assured that after only a few sessions with your new power unit you will quickly learn to recognise the danger signals.

Generally it may be assumed that the weight of the tool is sufficient for the attachment to perform its function with only

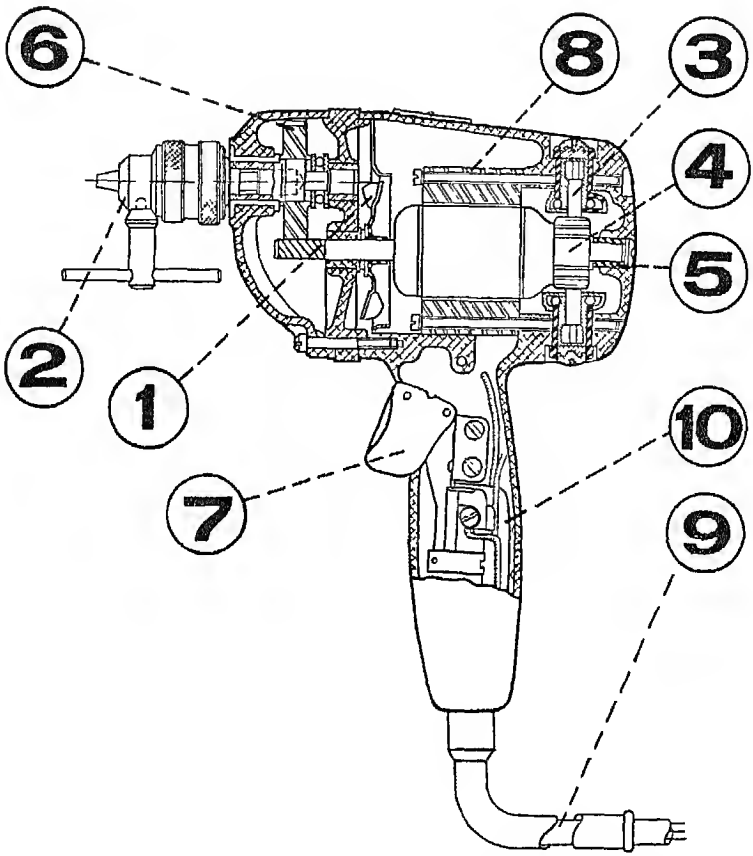


FIG. 4.—*The Black and Decker D500 Drill—main parts.* 1. Armature fan. 2. Quarter-inch geared chuck and key. 3. Brush Assembly. 4. Armature and fan. 5. Sleeve bearing. 6. Spindle and gear. 7. Pressure switch. 8. Field assembly. 9. Cable. 10. Switch insulating box handle and cover.

light pressure when the tool is used in its mobile form—naturally if you are drilling an overhead surface the pressure will be slightly more than if the tool were being held over the object. When the tool is being used as a fixed power unit—for instance as a bench-saw—the pressure brought to bear upon the material being worked should not be unduly heavy or the same angry scream will warn you that you are overloading it. The fast-moving saw-blade will eat its way quickly through a piece of wood without that extra pound of pressure which causes the moving parts to shriek in protest—always provided, as in the case of sawing, the line of cut is in line with the saw-blade as it may not be if the fence is not exactly parallel with the blade, and provided that the bulk of the wood is not beyond the capacity of the tool.

If a tool is badly and continually misused in this way the bearings, gears and motor will suffer damage. When I demonstrated the Black and Decker orbital sander for the first time on television, the advertising agents were most anxious that I should bring out the fact that *only* the weight of the tool was necessary to make the sander perform efficiently. This I did simply by using the unit with one hand, and driving home the lesson by blowing a satisfactory cloud of sanding dust from the work at the end of the demonstration.

So, from the very start, learn to listen for signs of trouble. If the drill jams—it won't if your set-up is properly assembled —switch off immediately, but don't try to force the tool along —check the assembly of attachment-components before you start blaming the drill.

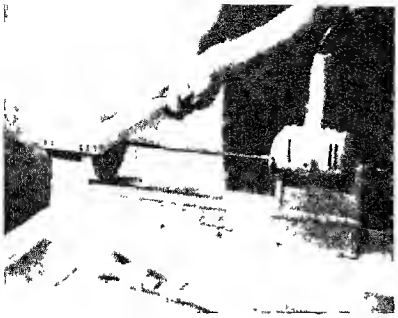
One of my workshop power units is eight years old, which is not at all bad for a small tool which some writers of the day contemptuously dismissed as toys. It runs as sweet as a nut. The last job it performed was sawing oil-tempered hardboard (the stuff they use for flooring roller-skating rinks) into just over 700 $2\frac{1}{2}$ in. by $7\frac{1}{2}$ in. pieces for a parqueted floor-covering. It got a little warm at times but it hummed its way

through the job in good tune except for a little chattering (very, very slight) with a pretty little pyrotechnic display of blue sparks visible through the vents at the back. This is another audible and visible sign of maintenance required—renewal or adjustment of the brushes, or smoothing of the commutator-bearing surfaces. You will see where these are positioned in the sectional drawings of power tools.

Because there is some sparking at the back of the tool this does not necessarily mean immediate corrective action. But when it is accompanied by an irregular chattering with an increase of whirling sparks it is time to do something about it. You will notice this with your own power tool, and you will observe how this increases as the tool grows older. The remedy is quite simple; the brushes require adjustment (although there may be some roughness of the commutator). You can buy new brushes and have them fitted by the manufacturer's service agents, who will also smooth the commutator if this is necessary.

There is yet another sign of overloading. This is apparent when the casing becomes hot. I mean reasonably hot because the tool in use will become warm. It is advisable to use a handle grip when the tool is portable—so that the vents are not choked with a case-holding hand. If the job is a long one, it is advisable to switch off and let the tool cool down when anything but gentle warmth is transmitted to the body casing.

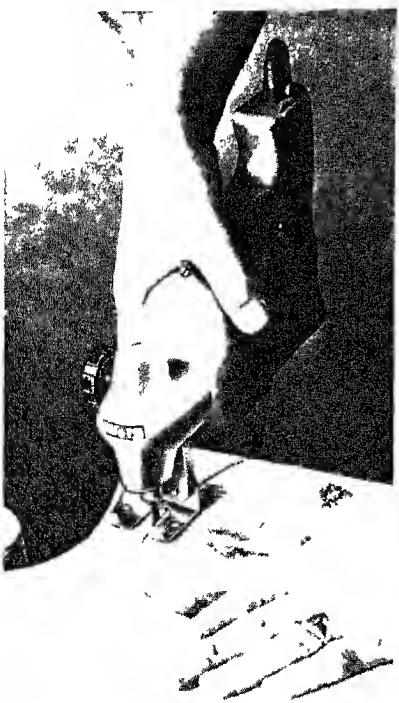
Which brings us back to my over-cautious friend who stuffs the lead up his jumper. This when he first started using a hedge-trimming attachment—not for him the doubtful pleasure of cutting through the snaking lead entangled in the mass of the hedge; he probably got the idea from television announcers who use hand-mikes with leads concealed in clothing. My friend disconnected the extension plug and socket and inserted the lead up the sleeve of his jumper and down the leg of his jeans. All went well—the idea worked perfectly—until a call from the house announced that dinner had been



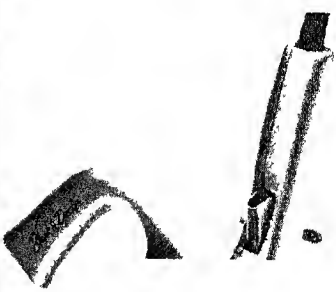
The Black and Decker Bench Saw

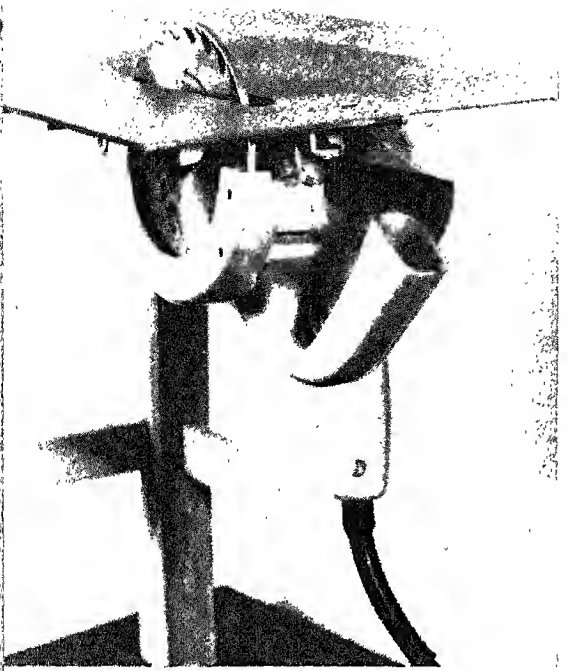
The Black and Decker Jig saw attachment fitted to the front of the Drill

The Wolf Jig saw cutting an intricate shape in 1½in thick wood



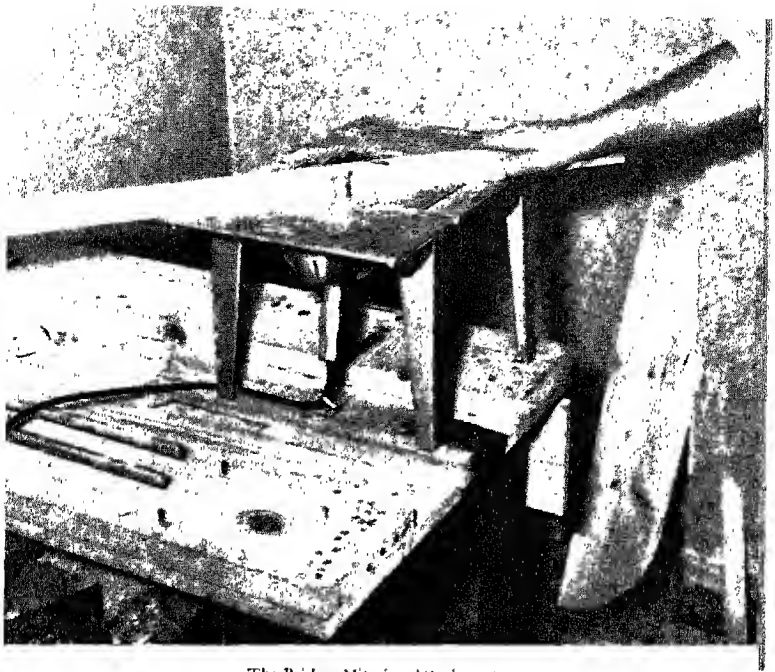
The Black and Decker Portable Saw Attachment





The Black and Decker Portable Saw Table

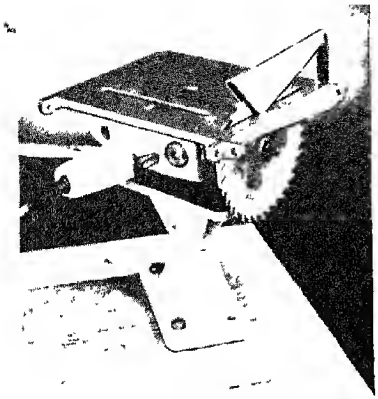
The Bridges Portable Saw in use; fitted to the Neonic DR2T Drill



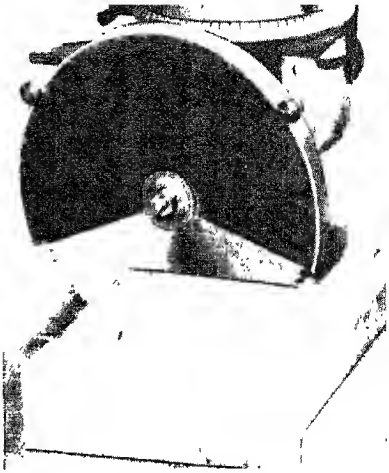
The Bridges Mitreing Attachment.

The Bridges Bench Saw/Groover.

The Bridges Comb Jointing Attachment.

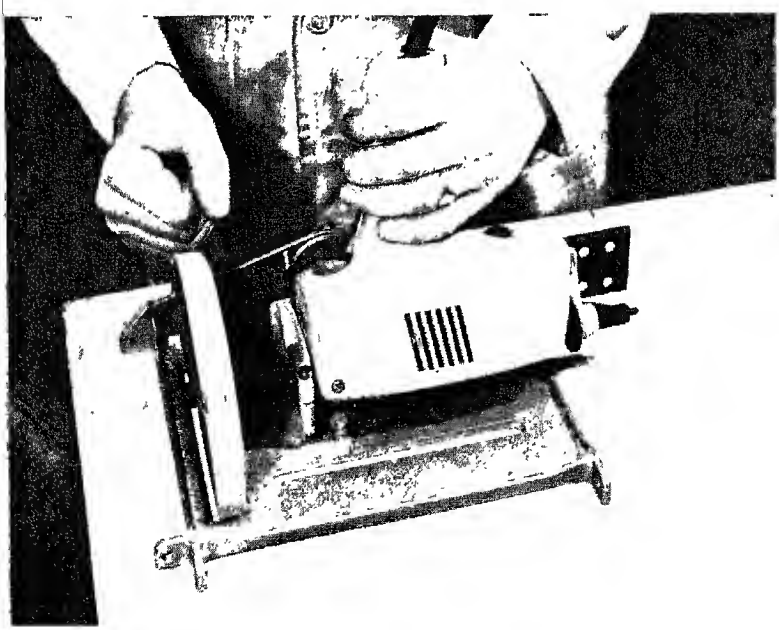


The Selecta Basic Bench Unit



The Selecta Crosscut Bench Saw

The Selecta Portable Saw



on the table for ten minutes and if you don't come soon it will be stone cold. Friend switches tool off, makes frantic dash for house, falls flat on his face with most of the hedge-trimming attachment stuffed down his jeans.

None-the-less the idea is sound; it is necessary to remember that the tool is powered through the cable—with a cutting attachment it could so easily slice through the cable before you have time to say Oh-what-a-clot-I-am. Before you switch on the tool for any kind of work make sure that the lead and the business end of the tool do not meet. Hook it up, clip it down, tuck it inside your belt, do what you will with it, but make it a firm rule to know where the lead is before you switch the tool on.

A little thought given to looking after your power unit, keeping it in good order and using it properly, will prolong its efficiency as a time, trouble and money saving tool.

CHAPTER 5

The Power Tool Workshop

MANY of the do-it-yourself books published in recent years (including some of my own) recommend our old friend the kitchen table as a suitable bench—a point of view not always shared by the female of the species who objects to serving cabinet pudding flavoured with real sawdust. While a kitchen table does make a suitable platform for many do-it-yourself activities, I am not convinced that it does form a completely suitable base for power-toolery; it is sometimes necessary to clamp or screw fitments to the bench (table-top) and although there are ways and means of getting round this I am not completely sold on a kitchen table for power tool activities. It seems to me to be a retrograde step to couple a super-modern tool to an old-fashioned way of working. If it is at all possible I strongly suggest that you try and do something a little better.

I'm lucky—so everybody tells me! At the bottom of my garden I have a beautifully laid-out and finished, brick-built slated-roof workshop which I cheerfully and boastfully claim is the best handyman workshop in the country. It was an old-fashioned coach-house, and my "luck" involved nearly two years' spare-time work in converting the old building, with lucky me slogging away at bricklaying, joinery, roofing, flooring, fitting-out and decorating—not to mention moving tons of rubbish and laying drains. My workshop is properly wired for power and lighting; there is a power point at the back of the bench, a light over each working point, and the system is separately fuse-boxed before connection to the house mains.

I am not going to cram my workshop down your throat through the rest of this book; as one who makes a living from do-it-yourself writing, it is essential for me to make my working conditions the best possible. As a spare-time power-tooler you will not require such an elaborate layout, but I do suggest that you make the most of what you have. Your aim will probably be between a super-workshop and the kitchen table —a place of your own where you can work in comfort. Your workshop may be a spare room, an attic, part of a garage, an outhouse or garden shed. Make the best of what you have and plan with an eye to the future. It is not necessary to do everything at once—work out a progressive improvement programme. Your power tool will be invaluable in assisting you in fitting out your workshop with bench, shelving and racks etc.—even if you do have to start on the kitchen table.

It would be foolish of me to spend space on elaborate workshop layouts with a chance of pleasing one out of ten readers, but there are some basic essentials which you should consider when designing your own workshop, as follows :

1. *Light*—you need as much light as you can get. Try to site your main bench (or other working platform) near a window, and/or arrange overhead artificial lighting in such a way that it shines directly on your work, not on the back of your head. Finish tool racks on face surfaces with light-reflecting colours and colour the ceiling white—it's not difficult to line the roof of a garden shed with softboard which can be painted after fixing.

2. *Space*—use it to its best advantage. If you fit a power saw stand and table across a fixed workbench the length of timber you will be able to saw will be restricted by the width of the bench—it is better to arrange the set-up to be able to work the length of the bench, unless

you have a conveniently placed window or door which you can leave open to extend your working length. Make the bench free-standing if possible so that you can pull it away from a wall if you have to. Rack everything you can on the walls—an overhead timber rack will save valuable floor space.

3. *Power*—make the best possible arrangement you can. The points should obviously be as near the bench as possible without the lead trailing across the working surface. The wiring should be adequate, the insulation and earthing fully effective. Fit your power tool point with a separate fuse if at all possible—don't place any reliance on a power supply consisting of odd lengths of flex (however much the joins bulge with insulating tape) hooked up to a nearby lighting socket, switch or power point. Your wiring and connections must be reliable.

4. *Safety*—if there are children about the place make your workshop lockable.

The rest of this section is devoted to instructions for making racks for power tools and, a workbench. The methods and designs are reasonably average—either can be modified to meet your own exact requirements.

RACKS FOR POWER TOOLS AND ATTACHMENTS

The rack is designed for mounting on the wall of a room or garage, or the inside of a garden shed. It consists of a frame covered with a piece of pegboard, and a completed rack is illustrated in Photo Two. Pegboard is the ideal material for this purpose; it is easy to cut and fix—tools, attachments and accessories may be regrouped as workshop equipment is in-

creased. Racks of this kind can be tailor-made to fit any available space.

Construction is done backwards to usual procedure—the panel is cut to shape before the frame is made; in this way the pegboard can be sawn between the rows of holes with neat edges, instead of ragged edges which might occur if the frame were made first. Note that the panel is slightly smaller all round than the frame (Fig. 7), and allow for this when cutting the pegboard to size. About $\frac{3}{4}$ in. is a reasonable margin for framing, but this is not critical to the last fraction of an inch.

Finish working the panel by sanding the edges smooth, round off the corners and round over the face sharpness of edges as shown (Fig. 7). Pegboard must be "conditioned" before fixing; this may be done before or after cutting panel pieces to shape. Conditioning consists of swamping the back of the material with water applied with a large brush, or from a watering can. The material should be laid on a flat surface and should be left for about 24 hours before fixing. The object of conditioning is to prevent any undue shrinking or swelling after the pegboard has been fixed to the frame.

Make the frames of strips of softwood—$\frac{3}{4}$ in. by $1\frac{1}{2}$ in. section is suitable—up to 1 in. by 2 in. material can be used, and the softwood should be bought "prepared" which simply means that it is ready-planed for immediate use. Remember that the framing is slightly larger all round than the panel pieces and allow for this when marking out and cutting.

The corners of the frame are secured with half-joints, these are shown in Fig. 7 and they are formed by sawing away half the thickness of the timber where the frame-members overlap at the corners. The outside corners of the frame are gently rounded off to finish neatly.

If the racks are being fitted to the inside walls of a garden shed or other wooden building, the framing is screwed to the framing uprights, the pegboard panelling being fitted last of all. If the racks are to be fitted to a brick wall (plastered or

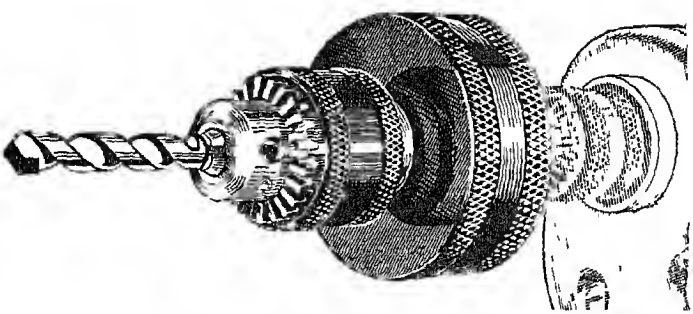


FIG. 5.—The Mason-Master Safe-D-Speeder reduction gear.

not) it will be necessary to plug the wall before driving fixing screws through the framing. The method of screwing is illustrated in Fig. 7. Drill holes about 9 in. to 12 in. apart, and countersink faces of holes. Position screw-holes so that they are concealed under the pegboard after it has been fitted. The plugging should be substantial—asbestos fibre plugging will grip fixing screws very firmly.

The corners of the frame are secured with screws and glue (Fig. 7). Countersink screw holes. It is best to assemble the frame as it is fitted to the wall surface. Check the position of each piece with the pegboard panelling. Complete the assembly of the frame, fit pegboard to frame then remove it for finishing.

The pegboard is joined to the framework with roundhead screws driven through edge-rows of pegboard holes at about 6 in. apart (see photographs). Each fixing screw is washered with a screw-cup (Fig. 7); this provides a very neat finish and the cups increase the gripping area of the screws. If the rack is a very large one it would be advisable to provide packing pieces spaced out at the back of the pegboard, the purpose of these is to prevent the pegboard sagging inwards under the weight of heavy sets of equipment, but they will not be necessary for small racks. The rack shown in Photo Two has four packing pieces of framing material, glue and pin to pegboard—make them diamond shape not to block the holes.

Note that the rack illustrated—Photos Two, Three, and Four—is fitted over a power point; should you encounter any obstruction of this kind—points or switches—cut a neat hole in the pegboard.

Finishing. The framing can be coated with priming paint before fixing. After fixing fill any visible screwholes (corners) and cracks with putty and apply one undercoat. The frame of the rack shown is finished with aluminium paint in an attempt to make surfaces as light-reflecting as possible. Finish the

pegboard with a light colour for the same reason—those illustrated were finished with emulsion paint (back and front) which is easy to clean and which has stood up very well to frequent use.

Fittings. These consist of hooks, clips and frames for hanging tools and attachments on the pegboard panelling. You can buy some manufactured fittings of suitable shape and purpose, but many of the parts you wish to rack will be of unusual shape as regards the purpose of manufactured fittings and you will be well advised to do as I did, to make your own fittings. It is quite easy to do.

You can make hundreds of shaped fittings from a small coil of galvanised wire—I used 14 s.w.g. and coated them with aluminium paint to finish. To do this job, you will need a pair of side-cutting pliers. A completed fitment is shown in Photo Four, and if you trace it back through Photos Two and Three you will see that it supports a small electric drill.

It does not matter what the shape of the fitment is—it *must* have two ends, and these must be dog-legged by shaping with pliers. In my experience of fitment-making I found it best to start shaping the middle of the fitment, trimming and shaping the ends last of all. The material is very cheap and after a few trial attempts you should experience no difficulty in housing all your equipment on well-shaped rack-fitments.

If you take another look at the photographs you will get some idea of how the plier-shaped fitments can be used ingeniously. The large round tin—roughly in the centre of the rack—accommodates a couple of sheepskin polishing bonnets. Under the tin there is a shelf (supported on bent-wire fitments) which takes three glass jars. These hold dozens of small parts and accessories such as arbors, washers, flexible drive attachments and drill bits. Note also in the photographs how the tool-leads are coiled and held in place with a short length of curtain spring.

Enclosed racks. If you wish to do so your racks may be enclosed with a simple box and doors. An idea of how this can be done is conveyed in Fig. 7. Secure back edges of box frame to side edges of rack, glue and screw corners. Fit with doors made of frames (with half-jointed corners); face fronts of door frames with plain hardboard, line insides with pegboard to considerably increase your rackage area. If you decide upon the method rackage, which has many advantages (you can lock your tools up) do make certain that the door frames are strongly made and that the hinges are robust.

WORKBENCH

There are dozens of ways of making workbenches. I suggest that you start off with a general-purpose woodbench of the type which provides a solid base for a power tool and attachments and equipment. There is some merit in making a separate saw-bench, depending upon the amount of work you intend doing, and also considering availability of space. Another type of power workshop bench is the cabinet type—like a low chest-of-drawers with a thick top—this also has several points in its favour, depending always upon the nature of your intended future work and space availability. For all-round usefulness there is nothing much to beat a carpenter's bench of conventional design which can be fitted with quick-release screws for speedy conversion to power tool use. Such a bench is illustrated in Fig. 8, and is described below. The quick-release fitment-screw idea is my own, which I have found completely satisfactory over a period of years.

The workbench (Fig. 8) is built on a series of frames which support the bench. Two are shown in the drawing, three frames may be used if the bench is a very long one. Frame construction is simple in the extreme. The legs are lengths of 2 in. by 4 in. softwood. The top rail is a length of $1\frac{1}{2}$ in. by 4 in. softwood which is jointed to the legs by cutting a notch at the top of each one (Fig. 8). The lower rail is a

length of 1 in. by 3 in. softwood nailed to the insides of legs at about 6 in. above lower ends of legs. Top rails may be screwed or nailed in their jointing notches.

The finished size of frames will be determined by the size you wish your workbench to be and you can tailor it to fit neatly into whatever space you have available. As a general guide the back-to-front width of the bench should not be less than 18 in. but 2 ft. 6 in. would give more ample working space as a reasonable maximum figure. The usual height for a workbench is 30 in. overall. Your bench can be as short as 3 ft. long increasing to 6 ft. as a reasonable limit.

The frames are jointed by the back, apron (the front board) and the top (Fig. 8). Reasonable bulk for the back board is 1 in. by 6 in. with the apron a little wider at 1 in. by 9 in. The top boards should be quite substantial in thickness—say 1¼ in. to 1½ in. Note that the front of the bench (Fig. 8) has two thicknesses of boards to give extra substance where it is most needed, and to provide a well for tools. If you wish the well may be dispensed with and the top made flat for power toolery. If this is the case the top of the back board should be taken down flush with the level of the flat top; otherwise (with a well) it should rise above the back of the top of the bench to level with the front.

Assembly is simple. The parts of the leg frames are glued and nailed; the top boards are screwed to the frames (top rails) with the heads of the screws sunk well below the surface of the boards. The apron and back can be nailed to frames and top. Finish by nailing a shelf across the lower leg-frame rails. This will increase the strength of the bench and will provide very useful storage space for odd lengths of timber. Complete your bench with a metal woodworkers' vice and with a bench stop. The quick-release power tool screw plates are fitted last of all.

But before describing these, a word of warning. Although your bench is fitted with a vice *never* use this to hold your

power tool. A vice is a bad substitute for the appropriate bench fitment, and there is a very real danger of cracking the case of your power tool if you try using it in a bench vice.

Quick-release fitments. These are for attaching the various types of bench fitments—drill stands, saw bench, lathe stands to the top of your bench. The usual method of doing this is to use roundhead wood screws, but I think you will find my method better. With the use of woodscrews the top of the workbench becomes pitted with holes which have to be repositioned as they become worn in use and fail to hold screw threads firmly . . . of course, one may continue using worn holes with longer and thicker screws, and presumably if one goes on doing this long enough the bench top will be more holes than wood.

I recommend the use of sash-screws for anchoring stands to bench tops. These rather old fashioned pieces of hardware were originally used for holding sash-windows open or closed to stop burglars breaking in—or kids falling out. You can buy them from a builders' merchant. These sash screws are of brass and have wide flat threads; they are supplied with threaded plate and a thinner unthreaded plate. Sink the thin (no thread) plate flush with the top of the workbench in the required positions, over a screw-diameter hole drilled through the top of the bench. Fix the threaded plate under the bench in agreement with the drilled hole. Use brass screws for fixing the plates and you won't damage cutting edges of hand tools against plates or screws.

The sash screw is inserted through the slot or hole in the bench stand and is turned into the threaded plate under the bench-top. Fixing and releasing can be done in a flash—thumb-and-finger tightness is sufficient to hold stands firmly in place. The positional placings of the screw holes in your bench-top will depend on the type and make of your power

equipment. In most cases six screw points will give you all the conversion latitude you require.

FOOT SWITCH

There is one other piece of equipment which is best dealt with in this section. It is not a commencing essential, but it will be found extremely useful as your power tool experience and knowledge bounds beyond the beginner stages. This is a foot switch of the type used in photographic studios, and which is fitted to some makes of electrical sewing machines. The advantage is obvious, both hands can be given to the work itself while the power unit is switched on and off with foot pressure.

Chapter 6

Drilling—Grinding—Burnishing—Polishing

In this section the tool is regarded mainly as a mobile unit used for its various purpose-uses which do not (generally) necessitate the use of the larger attachments which are available. I say *generally* because this section includes drilling and one form of drilling may be done with a bench attachment—this is vertical drilling where the work is brought to the tool. In its other mobile uses, described in this section, the tool in the main is brought to the work. Again this is a general appreciation of section contents, because grinding is described and a bench stand is necessary for grinding.

It might be better to describe section applications as smaller uses, but these are none-the-less important and *mainly* they are the uses for which electric drills were originally intended.

Drilling. There are two ways in which a power tool may be used for drilling a wide variety of materials, including wood, stone, tiles, bricks, plastics and different kinds of metals. In one way—the simplest—the chuck of the power tool is loaded with a suitable drill-bit and the tool is held in the hands to do its work of drilling holes. In the second method the tool is fitted to a bench attachment and the piece of work is placed on a drill-table which is raised and brought against the drill-bit—in some cases the table is fixed and the tool is moved.

It is my intention to break in with explanations where they are necessary in the instructional sections of this book. It is necessary at this juncture to explain *what I mean* by a drill-bit. In truth the drilling tools fitted into the chuck of an

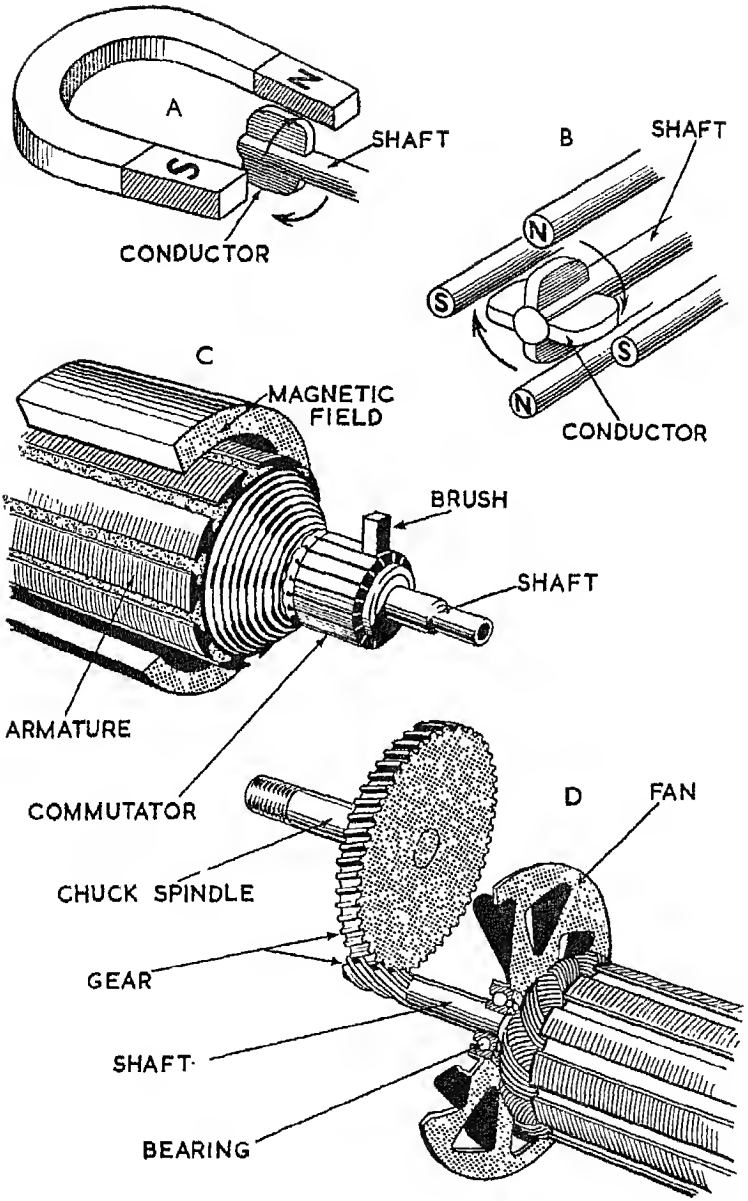


FIG. 6.—Principles and parts of an electric motor.

electric power tool are more correctly described as drills. But since the power tool itself is a drill it could be rather confusing if both things are given the same name—for the sake of book clarity—I shall therefore use the term drill-bit throughout these instructions to describe drilling tools which in catalogues are called drills.

Back to our two kinds of drilling—freehand and fixed. You will find both types of drilling illustrated in the photographic sections and drilling attachments are entered in the appendices at the end of the book.

First it is necessary to be reasonably certain that the right kind of drill-bit is chosen for the job, in both mobile or fixed drilling. It should be easy in a book of this kind to describe what drills can be used for which purpose—in actual fact the problem is complex. For instance, in most cases the drill-bit sets sold for use with power tools are described as being suitable for drilling metals. Appreciating the value of what has already been said about not working a tool beyond its stated capacity, in my experience these drill-bits will not drill holes in all metals—*it depends on the metal.* Remember that in almost every case the metal-drilling capacity (diametrical) of a power tool refers to *mild* steel. The problem arises when the user cannot differentiate between mild and hard steel. I am not suggesting that the manufacturers' information is misleading, but I do suggest that they may not be fully aware of the users' limited knowledge of materials.

Referring to metal drilling, my advice is that you use a high-speed metal drill-bit for all metals other than those you can recognise as being soft—brass, copper and aluminium being obvious examples. Whereas a high-speed metal drill-bit can be used for holing the softer metals an ordinary drill-bit *may* quickly be stripped of its point and cutting edges if used for hard metals. The natural correction tendency is to exert more pressure on the tool as the rate of drilling slows down, but we have already learned that this could be harmful to the motor.

How does the user differentiate between an ordinary metal drill-bit and a high-speed drill-bit? Quite easily; the ordinary metal drill-bit is the usual colour of steel—the high-speed drill-bit is blue and is marked on the smooth shank with the letters " HS " and the bit size (diameter).

Before continuing with other material drilling considerations, I will give you a few simple drilling rules, mainly for those who are newcomers to power toolery:

1. *Make sure the work is fixed.* A loose piece of work should be clamped to the drill table (for vertical drilling see Fig. 9), or to bench or table for hand-drilling. If this is not done the piece of work will almost certainly move when the drill-bit breaks through the reverse side of the material. A vice can be used to hold the work upright. Whatever method of holding is devised it should be strong enough to hold *firm.* A user could get a nasty knock from a piece of wood or metal moving at quite a fast speed.

2. *Back the work.* However the drilling is done, the piece of work whatever the material should be backed with a piece of waste material—a piece of hardwood will do. The purpose of this is two-fold; the back (or under) edges of the hole will be more cleanly finished and the drill will not damage a table or bench upon which the piece of work is drilled.

3. *Keep the drill straight.* Once the hole has been started the direction of the drill-bit should not be changed. This does not mean that the drill should always be at right angles with the material, drilling can be done at any angle but the direction should not be changed once the hole is started. To do so in hard materials will place undue strain on the working parts, and even a drill-bit of substantial size may snap if subjected to such treatment.

Back to our materials with some facts on drilling holes in

wood. The ordinary metal drill-bits will hole wood. At fast speeds, however, the wood may be scorched around the hole. Scorching is very likely to happen with the use of a countersink, a specially shaped bit used to finish a screw-hole for a countersunk screw. Scorching can be avoided by using a gear-reducer to slow down the speed of the chuck spindle (Photo Five). With softwoods the use of a gear-reducing attachment makes the tool easier to control. Incidentally the tip of the drill-bit will not wander off centre if the centre point is dimpled with a punch. A centre-punch is also used to start a hole in metal.

Some power toolers make the mistake of switching off before withdrawing the drill-bit. It is better to leave the motor running while easing the drill-bit from the hole.

In addition to twist drill-bits, wood-boring bits may be obtained for cutting holes in wood. These are similar in appearance to carpenter's bits used in hand braces, but shanks are round (instead of square) and are reduced to $\frac{1}{4}$ in. diameter for gripping in drill chucks (Photo 6). These may be obtained in sizes for hole-cutting up to 1 in., but it is not advisable to exceed manufacturers' stated capacity limitations, at least for drilling in hardwood. A little latitude may be allowed when using wood-boring bits in softwood, but at high speed there may be some scorching and it is advisable to sink holes in stages, resting the boring pressure as the hole progresses. The alternative is to use a gear-reduction attachment which does permit larger holes to be bored without friction-scorching. It should be appreciated that the turning action of the chuck-spindle is more powerful when chuck-spindle speed is reduced, and with a gear-reduction attachment fitted quite large holes can be bored in softwood and hardwood without unduly straining the motor. As with any other purpose-attachment the motor will shriek in protest if it is being overworked.

With the tool used in its mobile form—when it is held in the hands and taken to the work, it is advisable (as far as

possible) to use the holding handle supplied with the power tool. This provides a much better gripping surface than holding the drill casing. With some gear-reducing attachments the holding handle cannot be fitted; in this case care should be taken when holding the casing not to unduly restrict the vents by covering them with the hand. A power tool breathes through its vents and if the supply of air is restricted the motor may overheat.

Plastics and soft materials are best drilled at slow speeds to compensate for friction heat. This could easily soften and fuse plastics.

For masonry in general a slow speed is better than a high one. This permits a better control of the tool and will reduce the danger of any sudden changes of motor speed as the drill-bits bite through materials of different degrees of hardness (Photo Seven). Holes in masonry can be sunk quite successfully with a high-speed metal drill, this being hard enough to do the job, but in some cases control will be found difficult owing to the speed. This is particularly so when drilling into brickwork covered with plaster; unless the tool is held perfectly still even a slight wobble could tear out a large hole in the plaster before the tip of the drill-bit bites into the more solid brickwork. It is advisable when drilling plastered walls to press a piece of cellulose sticking tape over the plaster to keep the surface intact.

The best type of drill-bit for use with masonry is one fitted with tungsten carbide tips. These may be obtained in sets (packed in a plastic wallet) or they may be obtained singly in sizes ranging from 5/32 to $\frac{1}{4}$ in. Tungsten carbide tipped drill-bits may be obtained for high-speed or slow-speed drilling. A slow-speed tungsten carbide tipped drill-bit is shown in Fig. 5, the black part at the business end of the drill-bit is the hardened tip. A word of warning concerning misuse; it may be (and often is) considered that because a masonry drill has a specially hardened tip it may be used for drilling hard

metals, but this is not so and there is a strong possibility that the hardened tips may be torn from the point of the drill-bit if the tool is misused in this way.

There is another form of drilling which combines the mobile and fixed tool methods described above; this involves the use of a flexible shaft—you can see one in the photograph (Two) showing attachments stored on a pegboard rack. The flexible drive is fitted at one end with a shank which is secured in the tool chuck; the other end of the shaft is fitted with a chuck. In use the power unit is suspended from a ceiling hook, or it may be secured in a bench stand. The flexible shaft chuck may be fitted with any one of a good variety of small tools for fine work; these include shaped grinding wheels, cylindrical and pear-shaped burrs, rubber sanding heads, felt bobs, cupped bristle brushes and slitting saws.

Buffing. A buffing wheel is made up of a number of discs of calico which are held firmly together between holed metal washers. The wheel is secured by means of an arbor to the chuck of a power tool which may be used with a bench stand, or used as a mobile unit. A buffing wheel is used to impart a polished finish to soft metals and plastics.

Grinding. There are different types of abrasive wheels which may be used for grinding edge tools and for general grinding. These are fitted with a central hole; grinding wheels are fitted to power tool chucks by means of any arbor. Let's clear up this arbor business; " arbor " is simply a fancy name for an assembly which connects an attachment to a drill chuck.

The grinding wheel is obviously used for grinding, with in most cases, the power unit held in a bench stand, although the tool can be used for grinding in its mobile form. For sharpening some tools—chisels and screwdrivers are good examples—it is advisable to fit the unit with a gear-reducing attachment. The wheel turns much too quickly in high-speed drills; before you can say I-wonder-why-my-tool-has-turned-blue the

temper of the tool has gone up in smoke. For some types of grinding the edge of the wheel is used; for others the face (side) of the wheel provides a better grinding surface—a good example of this is the sharpening of drill bits. In this, as in many other aspects of power toolery, lack of common sense may spell disaster. If a hard object is brought with force against the side of a fast-spinning grinding wheel, the wheel may break up. So use this attachment sensibly; it will give you good service.

Burnishing. This is done with a wire brush. There are two kinds, one is in the form of a flat assembly of wire bristles, disc-shaped, and is used on edge. The other is a cup brush where the wire bristles project from the circular face of the attachment (Photo Nine). Either is fitted into the chuck with an arbor. The type of brush to use depends on the shape of the object; generally (very generally) the disc brush is used for burnishing and the cup brush is used for surfaces with crevices (such as an iron gate). Either may be used at the user's discretion for the type of job for which the brush is most suited.

There are other kinds of brushes made of softer (than wire) bristle materials for different kinds of burnishing and cleaning.

Polishing. Wood and leather may be polished with a bristle brush, and there are special attachments made for polishing floors. Usually, however, when the power unit is used as a polishing tool, it is fitted with a lambswool bonnet (Photo Eight). The bonnet is drawn over a rubber disc (which also is used for disc sanding), and the opening is gathered and tied at the back of the disc. This accessory is ideal for polishing cars and furniture. It is advisable to use the polishing mop with a speed-reducing attachment.

CHAPTER 7

Sawing with a Power Tool

ONE of the most useful accomplishments of a power tool is its ability to cut wood (and some other materials) when it is fitted with a sawing attachment. There are several kinds of saw attachments (which are described in this section), but the most useful in terms of time and labour saving possibilities is the circular saw attachment.

It would easily be possible to write a complete book on circular saw attachments alone, to deal with every aspect of their most versatile uses. Within the compass of this book, however, which is designed to cover the broad and general application of power tools and their purpose attachments, it is necessary to limit descriptions of individual attachments, and although I shall deal with the most useful circular saw attachment as fully as possible, I have of necessity, to be brief. There is an excellent book on power tool usage (by Clifford T. Bower) which gives more detailed information than I am able to provide, and much more additional useful information is given in monthly do-it-yourself magazines, which generally provide an excellent service to power tool users.

Before dealing with circular saw attachments, let us clear the decks by disposing of other power tool saw attachments. These are as follows:

Bench saw
Hole saw
Jig saw
Fretsaw

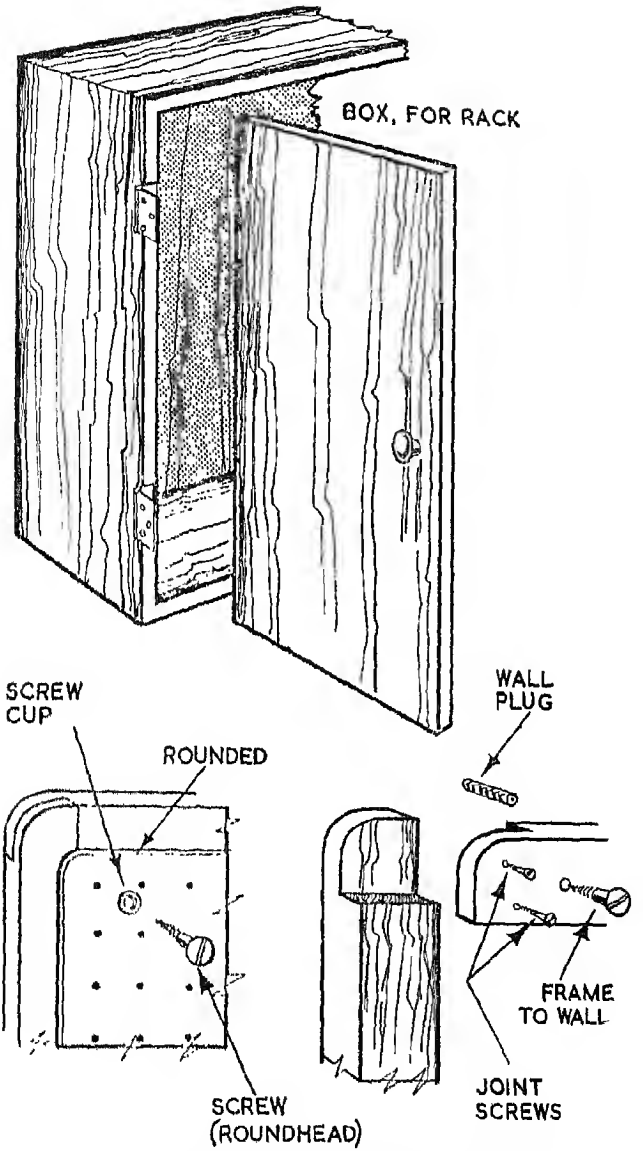


Fig. 7.—Power-tool rack. Details of construction.

These are briefly described below; further information will be found in the attachment appendices at the end of the book. Details of each manufacturer's saw attachment and accessories are given in their promotion literature.

Bench Saw. This comprises a bench stand assembly for the power unit itself and a stand for the saw table and saw blade. In some cases the stands may be combined in one piece as in the Black and Decker lathe stand. This piece of equipment is illustrated in Photo Eleven which shows how the saw blade is connected to the power unit with an arbor spindle. This will rip hardwood or softwood of substantial thickness ($1\frac{1}{4}$ in. for the assembly shown) with the grain, and will of course cut across the grain. The saw table is fitted with an adjustable fence, which extends to enable wood up to 9 in. wide to be sawn. The blade shown in the picture (Photo Eleven) is a "combination" saw. A fine-tooth saw blade is also obtainable—this obviously is for finer work than the ripping or cross-cutting done with combination saw blade. The diameter of combination or fine-tooth saw blade is 5 in.

There is a general point of interest concerning all types of powered saws fitted with a rip fence; the blade and fence must be in perfect alignment, and I do mean *perfect*. Otherwise the continuing sawing of a piece of wood will bring increasing pressure to bear against the side of the saw blade; as the work progresses the saw will slow down as it binds in the swarf and the motor will be overloaded before the saw jams.

The foot switch mentioned in a previous section is a useful addition to all kinds of sawing equipment; it permits both hands to control the work, and allows the power unit to be switched on and off at will.

Note in the picture (Photo Eleven) that the angle of the teeth of the saw blade is downwards (into the piece of work) when the saw blade is turning. This holds the wood firmly against the saw table and it is not necessary to exert any great

downward pressure. In use the piece of wood is fed gently against the fast revolving blade and it is not necessary or desirable to exert force to speed the work. Let the tool find its own speed of progress and listen for the growling note of the motor which warns you that the motor is being overloaded.

As the end of the piece being sawn approaches the table it is advisable to use a push-stick, instead of the hand exerting pressure, for safety's sake. You can make a push-stick from a piece of wood about 9 in. long, of about 1½ in. by 1 in. section. Round over one end of the push-stick and notch the other. This will give you control over the end of the saw cut, with safety—it should not be necessary for me to underline the dangers of allowing the hand to come too close to a high-speed power saw.

Fretsaw. This is a very useful attachment for those who wish to make shaped cuts (curves) in thin materials, although the attachment illustrated in Fig. 10 (Wolf) may be used for cutting tough plywood of up to ½ in. thickness. There are two ways in which the fretsaw attachment can be mounted. It may be fitted to a bench saw table and clamp, designed specially for this purpose (as shown in the drawing) or it may be used with a universal saw table, which as its name implies, may also be used with other types of saw attachments. There are four types of saw blades as under:

1. For wood etc.
2. Heavy-duty for wood etc.
3. For non-ferrous metals
4. Heavy-duty for non-ferrous metals

Control of the work is very easy; the cut is clean. The cutting capacities are as follows:

Plywood ½ in.
Perspex ¼ in.

Ebonite $\frac{3}{8}$ in.
Leather $\frac{1}{2}$ in.
Cloth (layers) up to $\frac{1}{2}$ in.
Mild sheet steel (16 swg) 1/16 in.
Aluminium (and Duralium) $\frac{1}{8}$ in.
Brass (and Copper) $\frac{1}{8}$ in.

This is not a basic necessity, but it is a most useful and robust attachment for power toolers whose intended work will include shaped cutting of the materials (and similar-type materials) listed above.

Jig Saw. Since a fretsaw is used (among other things) for making jigsaw puzzles, there may be some confusion over the names of these two quite different attachments. Of course, whereas the fretsaw blade is secured at both ends, the jig saw blade is only secured at one end—where it fits into the attachment which is connected to the chuck spindle. Two attachments are illustrated. These are the Black and Decker jig saw attachment in Photo Twelve, and the Wolf jig saw attachment shown in Photo Thirteen.

It is necessary to point out at this stage that although specific makes of attachments are referred to in the photographs, this does not mean that only the manufacturers named can supply the attachments described and illustrated. In fact this is not so; individual maker's attachments are described in the appendices at the end of this book, and of course are included in sales literature. It should be appreciated that it is not possible to picture every maker's complete group of attachments and accessories, to attempt to do so would turn this book into a catalogue, which is not my intention.

Back to our jig saws with another look at Photos Twelve and Thirteen. It will be seen that the attachments replace chucks at the fronts of the power units. In all the jig saw attachments the rotating chuck spindle force is converted into a very fast moving up and down action. The pitch of the teeth of the saw

blade is such that the sole plate is drawn firmly against the work when the tool is switched on. All that is then necessary is to guide the jig saw along the line of cutting.

As I have pointed out with other attachments it is not necessary to force the tool along; the moving jig saw blade holds the attachment firmly against the work and the tool is guided with firm but light pressure when it will quickly eat its way through a variety of materials.

In Photo Twelve the Black and Decker jig saw attachment is shown in use with hardboard, which it will cut cleanly and swiftly. It will, of course, cut through much thicker and tougher materials. This attachment is fitted with bellows which automatically blow sawdust away from the line of cut. Different blades obtainable for different purposes; there is a medium wood cutting blade, a fine ferrous metal cutting blade and other blades for other materials. Also obtainable are cutting knives for use with paper, rubber etc.

In Photo Thirteen the Wolf jig saw attachment is shown eating its way through a 1½ in. thick piece of softwood. This attachment also may be fitted with different purpose blades; it may be used for cutting steel (1/16 in.), non-ferrous metals (3/16 in.) and Formica etc. (1/16 in.).

I do not think it is appreciated what a useful general cutting tool the jig saw is. Its most obvious function is to cut intricate shapes in a good range of materials—this it will do cleanly and at high speed. But it will also cut straight lines at good speed. It can be used for sawing in awkward places inaccessible to other cutting tools. It may also be adjusted for bevel cutting up to 45°. It is especially useful for cutting materials supplied in large sheets.

The Hole Saw. Strictly speaking this should be described as a form of drill-bit. It is a metal cylinder (cup) with serrated (saw-toothed) forward edge; it is mounted on an arbor which fits into a drill-chuck; the forward end of the arbor incor-

porates a drill-bit which holds the hole saw steady in a self-cutting pilot hole as it bites quickly through the work.

The hole saw cylinder (or cup) is detachable from the arbor and may be changed for one of another size (cutting holes over 1 in. in diam.). Hole saws are made for cutting metals, but they are also very useful for sawing large holes in wood. Hole saws are not early essentials in the power tooler's workshop—they are made from very high quality tool steels and are somewhat expensive, but they are useful accessories to know about.

THE CIRCULAR SAW

Every electric power unit may be converted into a powerful saw with the addition of appropriate attachments. In general there are two attachments; one makes the tool a portable saw, the other a saw bench (or bench table). The portable saw is taken to the work; with the bench saw set-up the work is taken to the saw. With some differences which will be dealt with as soon as this section progresses the portable saw attachments are also used with the bench stand.

To clarify this explanation there is a portable saw attachment which may be used on its own; if the tool is turned upside down and attached (with its portable saw fitment) to a bench stand (or table) it then becomes a bench saw. This is a general description—with some makers the bench saw attachment is different from the portable saw attachment. Because of the difference between different makers' attachments I propose describing each manufacturer's equipment separately, for the sake of book clarity.

Black and Decker Saw Attachments. The 5 in. Portable Saw Attachment is shown in Photo Fourteen. It is attached to the front of the power unit and is driven from the chuck-spindle. It is fitted with a robust handle used to guide the saw in movement. A safety guard is incorporated in the attachment; the lower section automatically telescopes into the semi-

circular body as the blade cuts through the wood—it is simply pushed out of the way as the saw moves forward, and springs into place when the end of the cut is reached.

The portable saw attachment is fitted with a sole plate which is adjustable to enable cuts to be made at any angle up to 45°. At the normal position (90°) the depth of the cut is $1\frac{1}{4}$ in. It is also fitted with a rip fence (Photo Fourteen) for accurate cutting of widths of wood up to $3\frac{1}{4}$ in. wide. By reversing the rip fence the width can be increased to $5\frac{3}{4}$ in. wide. If the rip fence is removed the saw may be used freehand; for instance for cutting through sheet materials.

The Black and Decker 5 in. Portable Saw Table is shown in Photograph Fifteen. The name is perhaps confusing because with the portable saw fitted to the saw table it becomes a fixed tool. In actual fact the portable saw table is an accessory—not an attachment. The saw table enables the portable saw attachment to be used as a fixed bench saw. The saw table is fitted over a recess cut into the top of the bench and is secured to the bench with countersunk screws at the corners. The portable saw attachment, with the sole plate and rip fence removed, fits under the table, where it is held in place with a strong, quick release, spring clip. The saw guard telescopes in the same way as when the saw is portable, as the work is guided into the saw it pushes the guard out of the way.

The Bridges Saw Attachments. The "Nu-Rip" circular saw attachment, which is an extremely useful and powerful piece of equipment is shown in use in Photo Sixteen. The sole plate is adjustable up to 45°; it has a sturdy rip fence and is fitted with a safety guard which automatically retracts into the handle casing when the saw is in use. The depth of cut is $1\frac{1}{2}$ in. Note in the picture (Photo Sixteen) how the lead cable is kept well clear of the blade.

The Bridges Bench Saw equipment is illustrated in Photo Seventeen. The power unit and saw attachment is used with a

bench stand assembly, which may also be used with other pieces of Bridges equipment (for sanding, drilling and turning) and the saw table is fitted with an adjustable fence to guide the work against the saw.

The full name for the piece of Bridges equipment shown in Photo Seventeen is " bench saw/groover " because it can be used to cut grooves in wood. This is done by making the blade wobble from side to side as the piece of work is fed against the blade, by fitting the saw arbor with " wobble " washers. Grooving is described later in more detail.

Another Bridges saw attachment is illustrated in Photo Eighteen. This is the Comb Joint Attachment and the purpose of this piece of equipment is clearly shown in the picture. It will accurately comb-joint wood up to 1 in. in thickness, and may also be used for making angle or spliced joints in hardboard, plywood or plastics.

It is not my intention to describe the fitment and use of each piece of equipment in detail. Full instructions are provided by individual manufacturers with each attachment.

Another very useful piece of Bridges saw table equipment is the Mitreing Attachment shown in Photo Nineteen. This enables cuts to be mitred, or cuts to be made at any angle between 0° and 90° with a very high standard of accuracy.

Selecta Sawing Equipment. The makers of the Selectamatic drill have produced robust pieces of adaptation equipment. One of these is the " Basic " Bench Unit, which is shown in Photo Twenty and can be fitted with a circular saw/bench table. The " Basic " Bench Unit is part of the " Benchmaster " workshop combinations which can be assembled for a wide range of purpose uses, including sanding, routing, moulding, turning and drilling etc. In this section we are only concerned with powered sawing units.

Another of the Selecta sawing assemblies is shown in Photo Twenty-one. This is the rip saw attachment which reverses

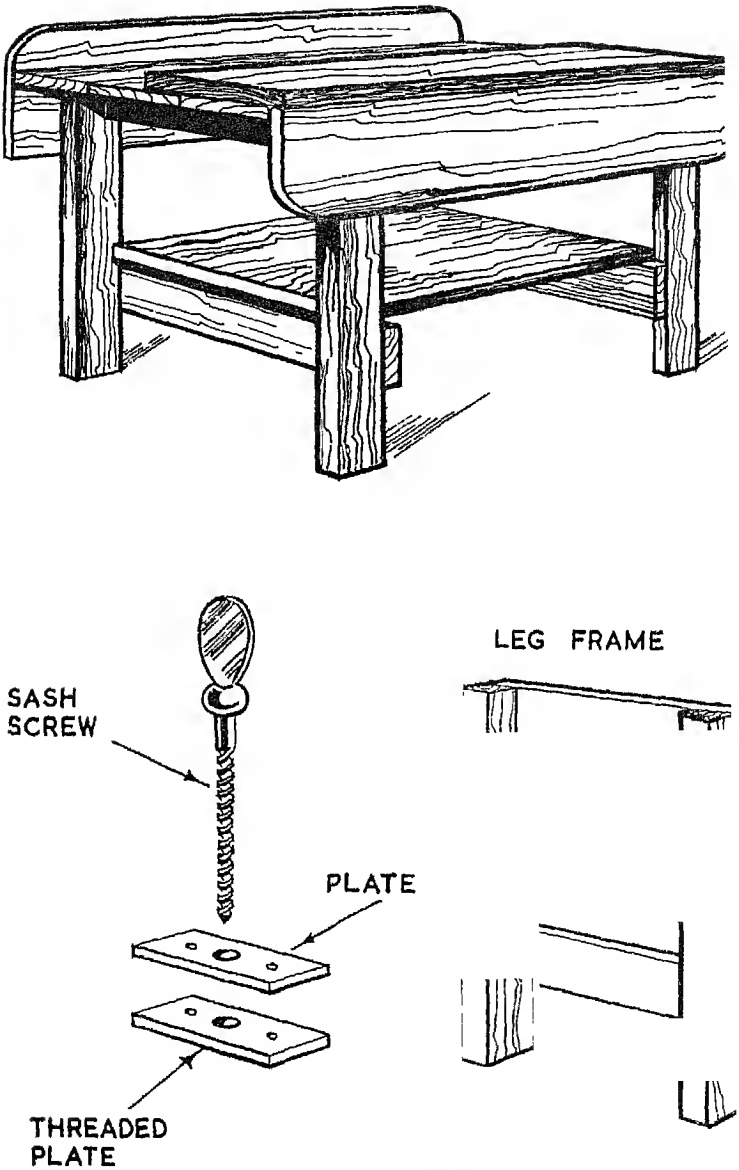


FIG. 8. A general purpose workbench. With details of leg assembl and quick-release attachment bench screw.

the usual order of things by working over the material rather than under it. The picture shows part of the Selecta "Home-Master" Workshop Equipment and the saw shown is cutting a mitre.

The Selecta Portable Saw is shown in Photo Twenty-two; another Selecta sawing attachment is used for comb-jointing.

Wolf Sawing Attachments. The Wolf Portable Saw and Groover Set is shown in Photo Twenty-three (and Fig. 11). The set comprises an attachment housing with an adjustable sole plate and incorporates an ingenious sawdust extractor. The safety guard automatically telescopes into the attachment housing when the saw is in use. The adjustable sole plate is adjustable to 45°; the ripping guide is for 3 in. wide cutting. The depth of cut at normal position (90°) is 1 11/16 in.; at 45° the depth of cut is 1⅜ in. The set includes adjustable grooving washers which enable grooves of ⅜ in. depth to be cut; the width of groove cut in one operation is also ⅜ in., but this may be increased by passing the piece through the groover more than once.

There is a Universal Table Set for converting the portable saw and groover into a bench attachment.

The Wolf Bench Saw Set is illustrated in Photo Twenty-four. This attaches to the power unit to form a really robust bench saw with a maximum cutting depth of 1 11/16 in. The Wolf Bench clamp is used with this attachment and the bench clamp may be used with other Wolf attachments. A very sensible straight-edge spans the full width of the table; it is hinged for quick removal when not in use and locks at both ends when in use. The saw plate aperture in the bench table can be varied in width by means of an adjustable plate for cutting narrow pieces of timber. The telescopic safety guard is spring loaded. The diameter of the rip saw blade is 6 in. The table can be tilted to an angle of 45°

One very interesting feature of the Wolf sawing equipment

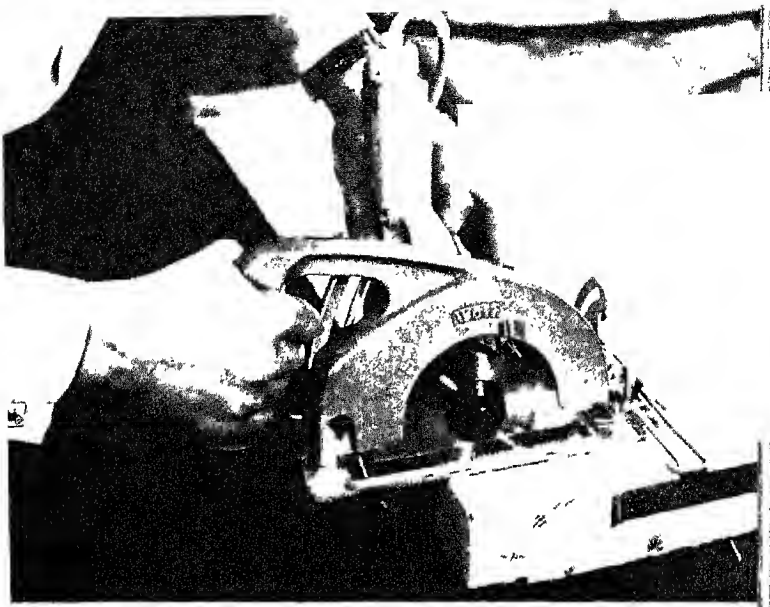
is a special cutting blade for grooving. This is quite different from the wobble-grooving action later described. The grooving blade is much thicker than the usual saw blade. It is 4 in. in diameter and cuts a groove of 3/16 in. wide to a maximum depth of 11/16 in. in one operation. The width of the groove may, of course, be increased by running the piece through the saw as many times as required, the straight-edge (fence) being adjusted each time. The depth of cut may also be controlled (under 11/16 in.) by raising the saw table on its stand.

GROOVING

I have briefly explained above how the portable saw may be used for grooving, used above or below the work. Grooving is done by using a special thick grooving blade or by using a wobble saw. Actually the saw blade is flat and straight, but it is fitted to the arbor with shaped washers placed each side. These impart a sideways movement to the blade as it rotates at speed; the movement is completed in half a turn and taking into account the speed of the rotating blade movement it can easily be appreciated how the repeated wobble cuts a square groove in the work passed over or under the tool. The washers may be adjusted to control the width of the groove, the maximum width (single) being $\frac{3}{8}$ in. Obviously, the width of cut may be increased by passing the work through the groover more than once with the straight-edge moved and tightened.

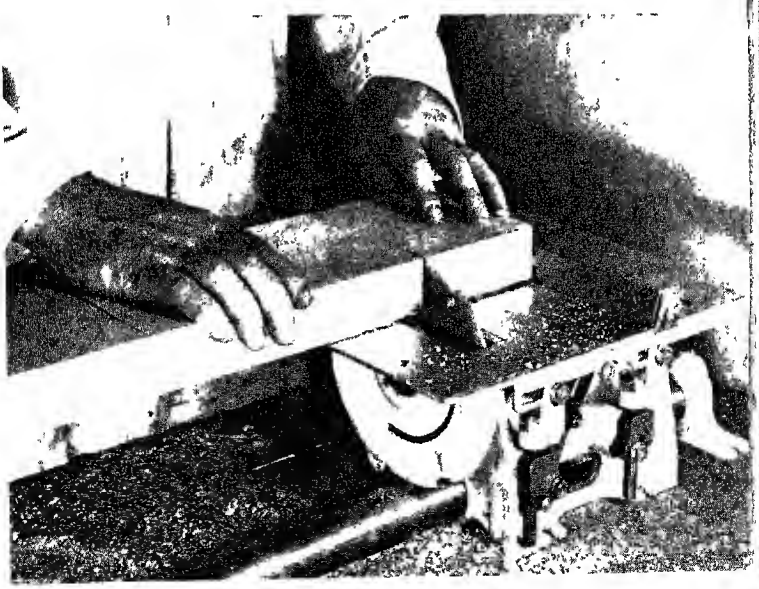
When the tool is working as a groover the load is greater than with straight sawing, and care should be taken not to feed the work too quickly into the wobble saw. Rebating may also be done with a wobble saw, and can be carried out with the portable saw (unwobbled).

The assembly of a portable saw attachment, and a groover—showing the wobble washers—is given in Fig. 11.



The Wolf Portable Saw and Groover Set—blade diameter is 6in

The Wolf Bench Sawing Set

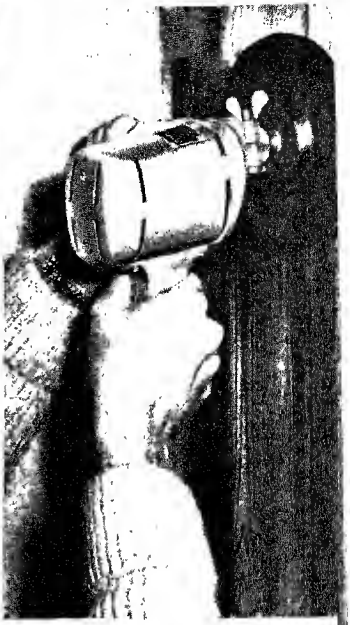


The Black and Decker Finishing Sander Attachment (*orbital*).

The Bridges Nu-Sander Attachment fitted to he Neonic Drill.

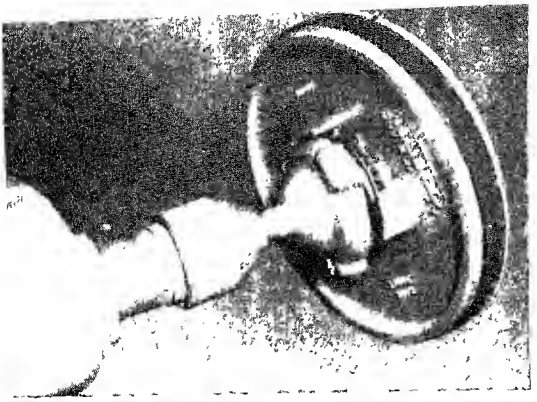
The Wolf Supasander (orbital) in use—fitted to the Safetymaster.

The Wolf Safetymaster fitted with rubber backing pad and sanding disc.

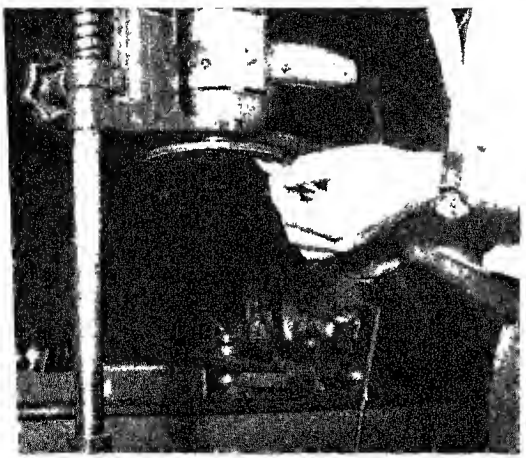


The Bridges Strippadisc. The 6in. diameter rubber backing pad is fitted with a carborundum abrasive disc.

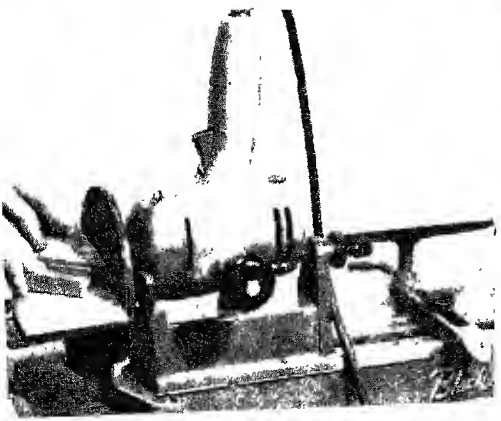
The Wolf Paint and Varnish Remover, in use with the Safetymaster.



The Stanley Swarfaway a flexible jointed sanding disc



The Black and Decker (Disc) Sander fitted to D500 in a vertical drill stand



The Black and Decker Table Attachment for disc sanding

NOTES ON CIRCULAR SAWING

It is advisable to use all portable saw attachments with the work firmly clamped to a bench top or table. Also if the cut is long, the beginning of the cut should be clamped or clipped to prevent it closing. Should this happen the pressure on the sides of the saw blade may grip the blade and jam the spindle which is not a very good thing to do with the motor running. The portable (and bench saw) attachments may be more easily controlled by the inexpert by fitting a foot switch as previously described. This leaves both hands free to control the tool or hold the work. Some practice is necessary with free-hand saw to guide the tool in a perfectly straight line. With the rip attachment fitted, the side of the board against which the fence is pressed while the tool is moving should be straight and square. If this is not so the saw may jam, or the line of cut may not be straight.

It is not necessary to exert any strong downward or forward pressure. The pitch of the saw teeth is such that in use the sole plate is drawn firmly against the work. It is only necessary to guide the tool with light forward pressure as the fast revolving circular saw eats its way through the work. Care should be taken when using rip fence controlled power saws, to keep the fence close against the guiding edge of the wood and it is advisable (as with all other purpose attachments) to try them out before actually putting them to work on a project for completion.

In most cases the blades of portable saws are mounted on the right of the power unit. The right-handed power tooler will use the saw with the weight of the tool resting on the main piece rather than on the waste. If for any reason this procedure is reversed, care should be taken when nearing the end of the cut to support the piece or the wood may split roughly along the line of cut—the uncut short end being the piece that splits.

As far as possible the work should be firmly supported, on bench or sawing stools. In some cases, as with sheet materials, it may be difficult to lay sheets flat if workshop space is limited, but large sheets may be rested against a wall and the saw (used freehand) taken across the sheet. It will, of course, be necessary to suitably support the back of thin sheet materials to give the saw working room, and to limit the bounciness of the sheet.

It will naturally be difficult to control the portable saw used freehand across sheet materials, and sometimes it is necessary to remove a rip fence (for bench work) to cut boards of greater width than the fence limit. In these cases a guide should be used. This is any straight piece of wood which is clamped to the sheet material (or board) to provide a firm edge against which the side of the sole plate can travel. Obviously care must be taken in lining up the guide accurately with the line of cut. In all cases of first-time-users it is advisable to try your skill—and get the feel of the tool—by first cutting pieces of scrap material. Remember always to listen to the the note of the motor which will give adequate notice of overloading.

The saw should be switched on before trying to start the cut and should be brought against the work (or *vice versa*) with the blade moving. Bring the saw to the edge of the work with the guide accurately aligned and let the blade eat into the wood without pushing hard. Pressure should be firm to keep control of the tool and to guide it; if the tool is forced it will slow down and the motor will labour. Should the saw blade jam in the cut, switch off immediately and ease the tool back. When you are satisfied that the guide or fence is correctly aligned, and that the cut is not closing from the starting end, switch the motor on and let the tool gather full speed before continuing the cut.

The depth of the saw cut may be adjusted to bring the blade farther below (or higher) the sole plate. It is advisable

not to make too fine an adjustment according to the thickness of the wood, and at all times it is best to use the deepest blade projection (beyond the plate) possible. At maximum projection the saw will cut faster with less strain on the motor although the breakthrough may be a little rougher. With minimum projection the breakthrough edge will finish smoother, there will be less risk of kicking (when the blade catches and kicks the work back) but it will require more power to cut through the material.

Chapter 8

Sanding and Smoothing

When this book was laid out—by that I mean when the subject matter was grouped under section headings—this particular section was intended to include many words of wisdom on planers—that is planing attachments for use with power tool units and not purpose tools (electric planers). But when it comes to the point there is very little to be said on the subject of planer attachments. Only one of the makers lists a planing attachment at all; this is the Wolf Bench Planer Set which is intended for use with the Wolf Cubmaster (or Cub) Electric drill. (There is also a Selecta planer fitment.)

The reason for this lack of manufacturer's interest is obvious—it simply reflects user interest which is not very great because most modern materials for woodwork are supplied prepared (machine-planed) or in smooth faced sheets.

So without more ado on the subject of planers let's concentrate our attention on smoothing attachments in the form of sanders. As with many of the other section subjects we use this term generally to embrace abrasive equipment some of which is not strictly sanders. In fact the term itself is a complete misnomer because sandpaper is not used any more—it's called glasspaper now, and has been so-called for years, but the term sanding is still used to describe the application (by hand or machine) of all kinds of abrasive papers and cloths. Come to think of it it would be rather odd to talk about glassing or glassers!

To make matters a little more confusing glasspaper (once called sandpaper) is not often used as an abrasive with modern

power sanders; the grains (which are flint or quartz) are not tough enough to withstand the high speed movement of disc sanders, although it is becoming more common to use *some* sanding attachments with the power unit fitted with a speed-reducer. If the soft grain materials (common glasspaper) are used they wrinkle and tear quickly and almost inevitably load.

Loading is simply a term used to describe clogging of the spaces between the grains of abrasive material, the spaces fill and the face of the sanding disc or strip becomes smooth. The speed with which the abrasive paper will load depends on the nature of the material being sanded. If old paintwork is being cleaned down the speed of the moving tool will (by friction) heat and soften the old paint and the abrasive face will be loaded before you realise what is happening—this of course, depending to some extent on the type of paint. Loading will take place quickly when the tool is used with some softwoods—those which are resinous or gummy loading the abrasive more quickly than woods which are older and drier.

This loading is not necessarily restricted to glasspapers, it can happen with any of the abrasive papers. It may be assumed that the better and harder the abrasive paper the more it costs. If you are, therefore, faced with a job which you know will clog the paper, it may be wise to use the cheaper grades. Appreciating this problem of power tool users, manufacturers are now producing metal discs which do not require abrasive papers which are designed for cleaning and smoothing quick-load surfaces (like flat-surfaced, revolving nutmeg graters). The description is perhaps rather unkind, because like all power tool attachments these paint-removing attachments are more carefully designed and made than nutmeg graters. We will take another look at these attachments later.

As explained above, there is little use for glasspaper in power tool sanding. A good general abrasive material is garnet, a mineral which is red in colour and which is considerably harder than the abrasives (flint or quartz) used for coating the busi-

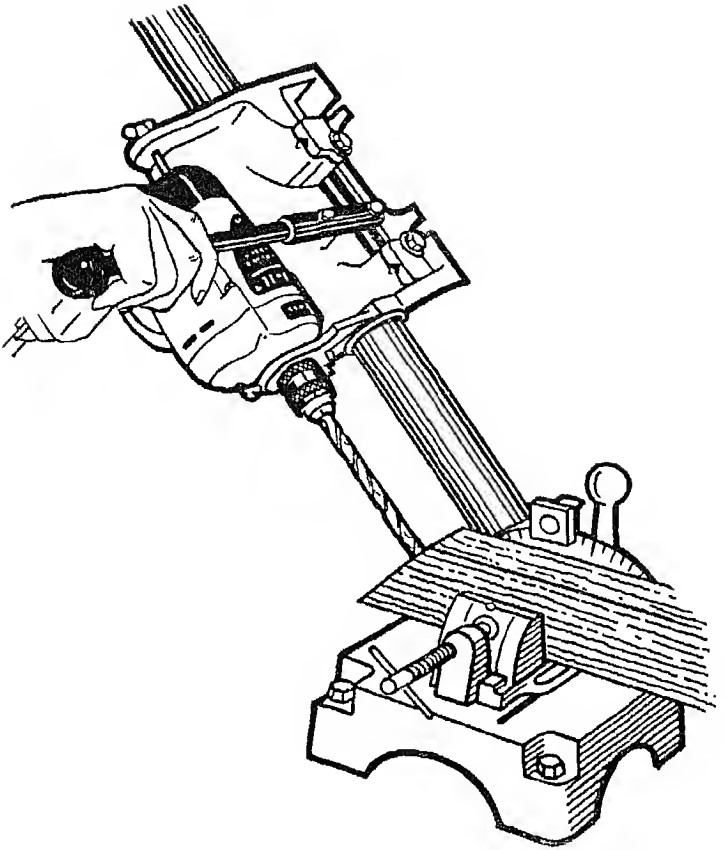


FIG. 9.—Drill bench clamp holding piece of wood for drilling with the Wolf Safetymaster.

ness side of glasspaper. Garnet will give very good service for sanding all kinds of wood, hardboard, soft metals and glassfibre (the material now being used for some car bodies and for making boats).

The next abrasive material in rising degree of hardness (and price) is aluminium oxide which is very tough indeed. Aluminium oxide is an artificial abrasive material, brown in colour (the others previously described are natural). In addition to suitability of use for all kinds of wood and hardboard etc. it may be used for smoothing metals—the other abrasives *may* be used for the harder metals, but they will not enjoy anything like such a long life as aluminium oxide.

These then, at *present* are the two main abrasive materials used for facing sanding discs and strips. I emphasise *present* suitability because a new type of sanding disc is being developed; this consists of a steel plate faced with small pieces of silicone-carbide—such an abrasive will have a very long life indeed. Also some silicone-carbide papers are obtainable.

Back to our two main abrasive materials—garnet and aluminium oxide—to explain another descriptive term, " Closed " and " Open " coat. The coat of course, is the layer of grains of abrasive material attached to the backing of tough paper. With open coat papers the grains are more widely spaced than those of closed coat papers, where the grains are so tightly packed on the face side that the paper backing cannot be seen. The difference in use is mainly one of speed; the closed coat paper will cut a surface down quicker than an open coat paper. This is obvious; it should also be obvious that the closed coat paper is more likely to load (clog) than the open coat paper. Since most home users will be mainly interested in sanding wood, it is advisable to work with an open coat paper rather than a closed coat one.

We now have two *main* types of abrasive papers (I stress *main*) because there are abrasives other than paper as I shall explain later; these are garnet and aluminium oxide which for

all general purposes are more efficient if they are open coated. The next factor for consideration is the grain size.

If an abrasive paper is coated with small grains it will obviously remove less of the material surface more slowly than a paper coated with coarse grains of abrasive. And the finer the grains the smoother and more polished the finish will be. It follows therefore that with many jobs it will be advisable to start smoothing with a coarse grade paper and finish the job with a fine grain paper. In actual fact the individual user will be able to decide the most suitable degree of abrasive coarseness according to the type of job. For most purposes a medium grade paper may be used, and it should be appreciated that in use the coarser grades will lose some of their sharpness. My advice is to stick to a medium grade paper for general purposes, finishing with a worn piece of the same grade paper. The complete answer to the problem in terms of beginner experience is to try various grades of paper on pieces of scrap material—you will soon get to know the performance (possibilities and limitations) of abrasive materials, density of coating and size of grain.

One confusing factor in identifying various grades of abrasive papers is the way in which they are marked, the identifying marks being printed on the backs of the papers. For general use abrasive papers may be classified as "coarse," "medium," or "fine"; classification may also be given as numbers (such as 100 or 60 etc.), or the grade may be identified by the size of the grains in "grit" numbers (grit is the same as grain). Grit size numbers are given thus: 1, 1/2, 2/0 etc., and to further add to the confusion different materials may have different grit sizes, garnet medium being 2/0, aluminium oxide medium being 1/0. Obviously the harder the abrasive the smaller the grit, or so it seems. To cut a long confusion short there is a very easy way to determine grades of coarseness by numbers (whether it's 100 on one paper or 4/0 on another) in simple terms of understanding the higher the

number the finer the grit—for example a paper marked 150 is finer than one marked 60; a paper marked 4/0 is finer than one marked 1/0.

The main abrasives (papers) are described above, but there are other kinds of abrasive materials—a grinding wheel is an obvious example. A wire-wool facing strip may be obtained for use with some orbital sanders; also for use with orbital sanders are strips of open-mesh abrasive materials which are called " sandscreens." These come in grades of coarse, medium and fine, and sandscreens are long lasting; should they become loaded with resinous sanding dust the screen is removed from the sander flapped against a bench or table top and the dust falls away between the meshes of the screen. The screen will of course clog if it is used on very gummy wood or to clean off paint, but it is not really intended for that job.

SANDING ATTACHMENTS

Generally these may be divided into two groups according to shape (a) flat (oblong) orbital sanders, and (b) disc sanders. I'm sorry I have to keep using the word " generally." I plead self defence—there are sanders of several different shapes (or other shapes of abrasive attachments and accessories)—abrasive bands, rolls, belts, and drums, but for the sake of book-clarity, and because it is true, in terms of home-user applications we are only concerned with disc and orbital sanders in this section. Although disc sanders (or sanding wheels) are the more common of the two I intend dealing with orbital sanders first—the disc sanding group of attachments having individual differences, which are not obvious at first sight.

Orbital Sanders. These are power tool attachments which are fitted to the front end of the power unit after removing the chuck. The chuck-spindle actuates the movement of the orbital sanding face which oscillates backwards, forwards and sideways. The oscillation is small in either direction of movement.

The movement speed is somewhere in the nature of 3,000 (movements) per minute, but this does vary according to make of sander and speed of drill used. The important thing to appreciate is that an orbital sander has a satisfactory optimum speed in terms of performance, and it is not necessary or advisable to use it in a drill fitted with a speed reducing attachment. I mentioned this particularly because, as I shall later explain, disc sanders may often be used with great advantage at slow speeds.

Three makes of orbital sanding attachments are shown in the photographs. Photo Twenty-five shows the Black and Decker Finishing Sander Attachment fitted to the D500; Photo Twenty-six shows the Bridges Nu-Sander Attachment fitted to the Neonic Drill (DR2T); Photo Twenty-seven shows the Wolf Supasander fitted to the Safetymaster Drill.

The face plates of orbital sanders are padded with felt, foam rubber or soft thick rubber to form a cushion for the various grades of abrasive papers placed over them. The abrasive papers are of course supplied in packets in sizes to fit over the face plates, where they are held in place with strong clips. Lambswool pads and polishing cloths are obtainable to make the orbital sanding attachments hand polishers.

Note particularly from the photographs (Twenty-five to Twenty-seven) that all the sanders are held lightly. It is not necessary or desirable to exert any strong downward pressure. Once the tool is switched on, all that is necessary is to guide it over the face of the work and let the weight of the tool alone be sufficient to keep the fast-moving smoothing surface in close contact with the surface under treatment. One distinct advantage which the orbital sander has over disc sanding is that it can be used right into corners.

Disc Sanders. There are two kinds; one attachment is a rubber backing disc with an arbor which fits into the chuck of a power tool for portable use, the other is a metal disc which is used mainly as a bench tool.

Rubber backing discs are usually 5 in. in diameter. They are fitted centrally on the face side with a washer and screw which turns into the arbor. The washer holds the disc of abrasive paper firmly in place. With the tool in use it should be fitted with a holding handle which will make the portable sander easier to control. Care must be taken when sanding wood surfaces to keep the disc moving in use; work in ever-widening circles from the centre to the edge of the work. If the tool is held in one position for long it may (especially in the case of softwoods) cut deeply into the wood. These scores and gouges are very difficult to erase. Again—the usual warning—it is not necessary or advisable to press the disc sander against the work with anything over normal holding force. A speed reducer may be fitted to overcome scoring and gouging.

Some disc sanders are shown in the photographs. Photo Twenty-eight shows the Wolf sander being used to clean a table top. Photo Twenty-nine shows the Bridges Strippa-disc; the 6 in. diameter rubber backing pad is faced with a new type of carborundum disc which is very tough indeed. The texture of the abrasive surface is open to prevent loading (clogging), the minute particles of carborundum give a very fast cutting action and this type of abrasive has a very long life.

After explaining that portable disc sanders usually have rubber backing pads, it is necessary to add that in some cases backing discs are of metal, in others they are metal faced with rubber, and in yet other cases for special purposes a metal disc is used without a facing of abrasive paper. Such an attachment is illustrated in Photo Thirty which shows the Wolf Paint and Varnish Remover in use. The 4 in. diameter metal disc is perforated to provide dozens of cutting edges; at the back of the attachment there is an ingenious fan to reduce the friction heat of the fast-moving stripper. It may be used for stripping paint without clogging, and of course it will work out cheaper and quicker than using abrasive sanding paper.

An example of another portable sanding attachment is shown

in Photo Thirty-one. This one is both rubber and metal; it is the Stanley Swirlaway—a good example of an attachment produced by a manufacturer outside the group of power tool makers. The Stanley Swirlaway has a flexible ball joint which eliminates gouges and sanding swirls; the bearing load is evenly distributed and the abrasive paper has a longer life. Very little pressure is required to keep the sander in contact with the work, or to guide it, and it does not wander as some rubber discs may do. Whatever the position of the power unit the sanding face remains in close contact with the work, but the flexible joint may be locked if required.

Bench Sanders. These are also disc shaped but for most purposes they are used with a bench stand and become a fixed tool to which the work is taken, although they may also be used apart from the bench stand as portable sanders. Photo Thirty-two shows the Black and Decker disc-sanding attachment fitted to a vertical drill stand for sharpening tools. Its rather more common function is shown in Photo Thirty-three, where the attachment is fitted to a bench stand.

As a bench tool the sander is fitted with a sanding table. The disc is of metal and remains rigid—naturally! The abrasive paper is cemented to the face of the plate, either using a self-adhesive backed paper, or using a contact cement. The cement is sufficiently strong to hold the abrasive paper firmly against the metal disc, but the nature of the adhesive is such that the paper may be peeled off when its useful life is exhausted, or to change the grade of coarseness.

The main function of the bench sander is to finish wood—it will quickly clean up rough-sawn edges, but it may also be used in its own right as a cutting tool (call it shaping if you will) as it will quickly sand away any kind of wood placed against it. The most obvious example of its value in this respect is (as illustrated) the finishing of a mitre. Although it will quickly

trim rough edges and shapes as much of the cutting as possible should be done with a saw to avoid excessive wear on the abrasive paper. Note in the picture how the lead-cable is neatly tucked away from the business end of the tool.

In addition to cleaning up and finishing square edges, the bench sander can be used for accurate chamfering and bevelling. The bench sander is a most useful piece of equipment in the workshop of a power tool enthusiast.

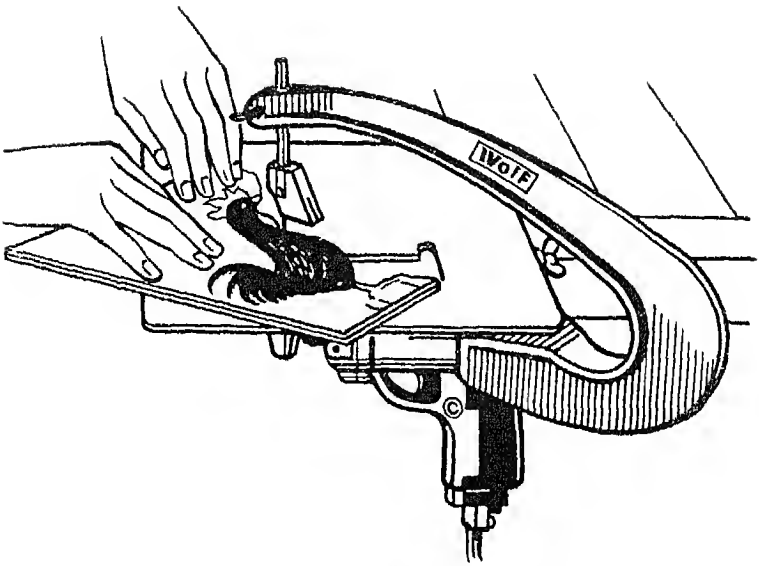


FIG. 10.—The Wolf Fretsaw.

CHAPTER 9

Conversion Attachments

ACROSS my synopsis notes on this section and the next one is scribbled the word "tiddleyposh" which (for the benefit of those who have never met this particular expression) tells me that the time has come to start clearing away loose ends which almost inevitably poke out of the tidy wordiness of a book of this kind.

Not that I consider the information which follows has less value than that which has gone before, but with such a broad and scattered subject it is difficult to group every little piece of information under definite headings—as you will see. Having dealt with the main purpose attachments it now remains to describe those which I could not fit neatly into the previous sections. In my opinion these extra power tool purposes effectively demonstrate the amazing versatility of this modern approach to handiwork and the ingenuity of the designers and manufacturers is truly remarkable when you consider that all this stems from a tiny electric motor which can be held in the palm of one hand.

First of all we will take a look at those attachments and accessories which are allied to workshop applications; we will leave the other (household) conversion fitments until last.

Wood turning lathe. Each of the leading power tool manufacturers lists fittings and attachments for wood turning lathes, and these are mentioned in the appendices at the end of the book. An example lathe is shown in Photo Thirty-four; this is the Black and Decker lathe equipment, which in the photograph is powered with the D500.

The wood turning lathe illustrated has a rigid vibrationless base which can be screwed to a bench top. This is the type of bench fitting which can be anchored with the quick-release screws described in Section Five. The lathe stand is fitted with a full size tool rest, face plate, turning attachment, and sliding head and tail stocks. The head stock is reversible and may be used as a horizontal bench stand. The face plate can be used with the Black and Decker vertical stand for sharpening and honing.

Lathe equipment such as this allows the home worker to shape a wide variety of wood turning projects. It is remarkably easy to use and wood turning can be made a full and interesting sparetime pastime.

One of the jobs which can be turned out is lamp stands and standards. The Wolf range of equipment includes a set for drilling through lamp standard sections. This is the Long Bore Drill Set which may be used to drill 5/16 in. centre-holes to a maximum depth of 18½ in. By reversing the timber a depth of 24½ in. may be attained.

Many of the parts of the lathe sets and attachments may be used for other purpose uses. For instance, the Bridges Lathe Kit may be quickly upended for use as a bench vertical drilling machine. The bench stand used with the lathe equipment (and the vertical drilling machine) may also be used with bench sanding and sawing equipment.

In every case you will find that it is not necessary to buy a complete set of new equipment or attachments for wood turning. Usually it is only necessary to add a very few parts (tool-rest assembly, for example) to be able to convert general purpose attachments into a sturdy lathe.

Concrete Mixing. This is really getting the most out of a power unit. Mixing concrete is one of the toughest jobs (in terms of hard labour) the week-end do-it-yourselfer can tackle. I can vouch from personal experience how much time and effort can be saved with a powered concrete mixer.

There are at present two mixing attachments. One is the Bridges Power Mixer which can be used for knocking up a bucketful of stuff at a time, the other is the Wolf Rotamix which, as you can see from Photo Thirty-five handles reasonably large batches (in terms of one-man-efforts) at a time.

The Bridges Power Mixer Attachment is shaped like a large auger bit. In use the attachment is lowered into a bucket containing the concrete ingredients, the power unit is switched on and the mixer rotates. The mixer lifts the mixture in a continuous stream from the bottom to the top of the container (bucket or small drum), whence it returns to the bottom and is then recirculated. The mixer may also be used for turning mortar, paint, distemper and for poultry foods and mashes etc. This one piece attachment is simplicity itself to fit and operate. The makers print a warning on their leaflet, here it is: "As this attachment will be used mainly for 'wet' mixes, make sure your drill is plugged into an earthed socket." The attachment may, of course, be used with any electric drill of $\frac{1}{4}$ in. chuck capacity; if the drill is a Bridges Neonic, the eye will light up if the circuit is safe.

The Wolf Rotamix Photo (Thirty-five) will mix concrete, mortar, fertiliser, seeds, poultry foods, much better and faster than can be done by hand. Supplied with the Rotamix are instructions and recipes for a wide variety of mixes. Take another look at the picture; the metal drum ($13\frac{7}{8}$ in. diameter, 24 in. deep) rotates on a steel frame assembly — the drill (Safetymaster) is attached to the assembly at the bottom of the drum, which is connected with a very low gear to keep the drum moving slowly with the power unit switched on. Supplied as a separate pack is mobile conversion equipment which comprises wheels axle and extension handles. These may be fitted to the frame so that the Rotamix can be wheeled about on the site.

I hope the Wolf people won't mind if I make a mild criticism (which is pretty obvious anyway), the Rotamix is an

excellent piece of equipment if you have *large* amounts of work to do—for instance a large garage floor, or long drive, but it is hardly the thing to dash off and buy if you only want to knock up enough concrete to make a step for the back door. But my mind is geared to crafty ideas for making things pay for themselves and purchase of a piece of equipment of this nature could be considered as an investment if you live in a district where you may be able to hire the mixer out.

Mixing Paint. In the early sections of this book, I introduced a collection of strange relations and acquaintances who do peculiar things with their power tools. I must confess that I used them to drive home lessons on correct usage and safety in a way which I thought would be more likely to be remembered than a dull series of dire and prosey warnings of the possible fate of those who have little knowledge of the power of power tools—I'm willing to bet that anyone who uses a hedge-cutting attachment after reading this book will conjure up a picture of my old-stuff-it-up-your-jumper friend and will keep a wary eye on the cable.

Be that as it may, I must take space to tell you of my first experience with a paint-mixing attachment — this time the story is true. I once had to demonstrate a paint-mixing attachment in a TV programme, and left actual use until the final camera rehearsal, a few minutes before transmission. Mr. Know-it-all didn't bother to read the instructions, switched tool on, plunged it into large tin of paint, and whipped it out tilted and still running. Result; cameras, set, and sound and vision operators speckled with paint. The only things not splattered were myself and the producer (who cowardly hides himself in a glass box). Such was the surprise of the microphone-boom operator that he fell off his perch; the mildly hysterical studio manager developed hiccups which lasted all through the programme. The moral is simply this—switch on and off with the mixing attachment in the paint, don't remove it with the motor running.

I like paint-mixing attachments, for the simple reason that very few do-it-yourselfers really stir a tin of paint thoroughly and the success of painting does to a large extent depend on thorough mixing—at least ten minutes by hand. A powered paint-mixer does the job more thoroughly and quicker.

An example paint-mixing attachment is shown in Photo Thirty-six. This is the Wolf Paint-Mixer loaded into the chuck of a Safetymaster drill. The business end of the tool is fitted with paddle fins which ensure that the paint is mixed just as the paint manufacturers intend it to be.

Paint Spraying. The Bridges Spraying Attachment is shown in Photo Thirty-seven. The equipment comprises a compressor (attached to the front of the Neonic drill in the picture) which developes a pressure of 100 p.s.i. (pounds per square inch). This works together with a trigger-operated spray gun which is connected to the compressor with a 10 ft. hose. The equipment has sufficient power to give the atomisation essential for perfect spraying of all types of paints, enamels, cellulose etc. The results are of a very high standard of excellence.

So far we have now dealt with the main purpose applications of power units. There is a Boot and Shoe Repairing Set put out by the Wolf people, and this is described in their sales literature. Some other accessories and attachments will be found listed in the appendices given at the end of this book. There are of course special purpose tools such as belt-sanders, heavy-duty grinders, metal shears and others which do not come within the scope of this book. Any of the manufacturers mentioned will be pleased to send details of special purpose electric tools to those who wish to know more about them.

There are still some uses (domestic) which we have not yet dealt with; these are grouped in the next section.

CHAPTER 10

Household and Domestic Attachments

THESE ARE regarded as *extra* purpose attachments, although —if you wish—you may commence your power tool activities by buying a floor polisher for later conversion use for the handyman purposes dealt with in the previous sections.

Hedge Trimmers. One of the most useful of domestic attachments is the hedge-trimmer—it may also be used for pruning. Each of the three leading makers of power tools includes a hedge-trimming attachment in their lists. The one shown in Photograph Thirty-eight is the Bridges Nu-Shears Hedge-trimming and Pruning Attachment (Mark II). The attachment fits to the front of the drill, after removing the chuck, and the movement is actuated by the chuck-spindle. The twin-form blades cut the toughest of hedges speedily and effortlessly without clipper bruising. A pruning shield is provided to slip over the blades; this leaves the Pruner exposed for cutting large twigs, and rose bushes, etc.

There is no doubt that these very useful attachments will relieve the tedium, and will reduce the labour, of cutting hedges. As the tool is used out of doors, it is obviously necessary to ensure that the power unit is adequately earthed. In most cases this will involve the use of an extension lead and it is essential that there is efficient extension of the earth wire from point to tool. It is advisable to use the tool in dry weather.

Gardening Attachments. All the leading makers of power tools include a range of gardening attachments in their lists. Shown in Photo Thirty-nine is the Wolf Soil Cultivator, in use with a Safetymaster Drill. This attachment is ideal for earthing-up, soil-conditioning, working in fertilisers, etc.

Among a variety of other attachments in the Bridges list is a Rotary Hoe Attachment which is used for hoeing and tilling. This is a robust piece of equipment which is precision made; it has twelve rotary blades which break up the earth speedily and thoroughly.

Another piece of Bridges gardening equipment is a Grass Cutter Attachment which has a rotating blade. The scythe-like action makes it ideal for long grass and for trimming borders. Also in the Bridges lists is an Insecticide Sprayer. This uses the same compressor as the paint spraying (Photo Thirty-seven), but the container is large, being a two-gallon drum. There is a 3 ft. spraying lance—the trigger valve is connected to the container by a 6 ft. hose. When required for use beyond the reach of a power point, the container can be pre-pressurised and disconnected from the compressor. This useful gardening attachment may also be used for spraying creosote, lime-washes and tar oils, etc.

The Wolf list of gardening attachments includes a Verge Trimming Set for dealing with edges of lawns and flower beds. The Wolf Cultivator (Photo Thirty-nine) has self-lubricating bearings and stainless steel tines. The Wolf Hedge Trimming Set includes a clippings bag which is attached to the lower edges of the tool in use.

Floor Polishers. A floor polisher is the chief item of power tool household equipment. A very efficient floor polisher attachment is listed by each of the main dealers—Black and Decker, Bridges, Wolf. The floor polisher unit shown in Photo Forty is the Black and Decker Floor Polisher, which is shown in use powered with the D500 Drill. The casing encloses an assembly which is fitted with twin revolving brushes, for working the polish in quickly. A pair of lambswool pads is supplied; these clip on to work up a brilliant shine quickly and easily.

There is no doubt of the efficiency and value of these floor

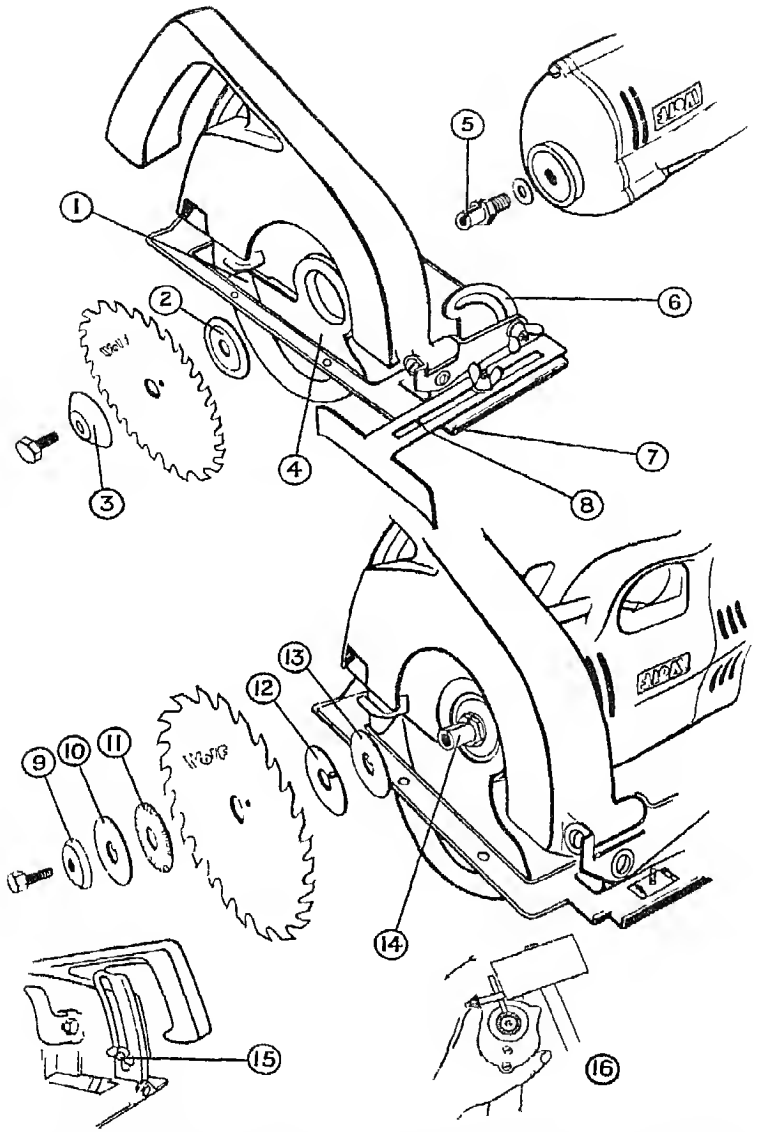


FIG. 11.—Telescopic saw guard. 2. Inner flange. 3. Outer flange. 4. Soleplate. 5. Arbor stud. 6. Mitre block (graduated for setting of soleplate). 7. Line of cut with saw set at 45°. 8. Line of cut with saw set at 90°. 9. Recessed washer. 10. Washer No. 4. 11. Washer No. 3. 12. Washer No. 2. 13. Washer No. 1. 14. Arbor stud screwed into Wolf power tool. 15. Cutting depth gauge. 16. Method of removing power-tool chuck before attaching arbor stud.

polishing attachments which reduce a laborious chore to light and pleasant work.

Food Mixer. This is shown in Photo Forty-one. When I asked my partner (and spouse) to describe this attachment she said: It mixes food. These women always get the last word!

Conclusion

IN THIS BOOK I have set out to describe modern power tools and their various purpose attachments. I have explained the elementary principles of working, and I have given what I hope may be considered sensible advice on handling, with particular emphasis on safety. I have tried to paint a broad and general picture of power tools and their uses, but I have not attempted to give detailed instructions on the many, many uses of power tool workshop equipment. There are two reasons for this; although this is quite a good-size volume as technical books go, it would require a book of many times this size to do full justice to every use of every attachment. The other reason is that the makers of power tools issue their own instructions for the fitment and use of attachments—to copy them into this book would simply be duplication and waste of space. Each of the do-it-yourself-type magazines publish articles on power tool usage (some written by myself).

In the following pages you will find listed some of the many attachments and pieces of workshop equipment designed, devised and produced by various manufacturers. I suggest that before buying a tool or equipment that you obtain full lists from the maker of your choice, or from one of his local agents.

May your power tool activities bring you as much pleasure and satisfaction in accomplishment as mine have.

John Christopher.

Appendices

The following pages list the main attachments of the leading makers of power tools, and gives some information of power units not mentioned in the previous sections of information. Some of the attachments have been described, many are pictured in the photographic sections. In each case manufacturers will be pleased to send full information on their products on application; this information may also be obtained in most large towns from manufacturers' accredited dealers. The appendices are as follows:

A—The Black and Decker Range of Attachments
B—The Bridges Attachments and Accessories
C—Selecta Home Workshop Equipment
D—The Wolf Range of Home Power Equipment

APPENDIX—A

THE BLACK AND DECKER RANGE OF ATTACHMENTS

The Black and Decker D500 is the B. & D. power tool of chief interest to the home handyman. It will drive an excellent range of attachments and accessories. Another Black and Decker Handyman tool is the D750 (1,750 r.p.m.). It has a drilling capacity of 1/16 in. to 5/16 in., in metal, brick and tiles etc., and up to $\frac{5}{8}$ in. in hardwood. Special D750 features are the new motor with very high power-per-weight performance, helical gears (with inter-gear) for smooth running and increased torque; 3-jaw geared chuck, removable side handle (which may be fitted either side). This drill can be used with all Black and Decker attachments.

There is another power unit designed to stand up to extra heavy-duty work. This is the D750A (900 r.p.m.), which is a $\frac{3}{8}$ in. (chuck capacity) drill. This has all helical reduction gears giving an exceptionally high torque at the chuck making the unit suitable for heavy-duty work.

Also in the Black and Decker list is a very good range of standard and heavy-duty drills, with a full selection of accessories and attachments for them. Several special purpose power tools are listed by B. & D., such as Hammers, Screwdrivers, Tappers and Saws, etc. Our interest here in the following lists is centred on home-user tools and attachments.

There are two ways in which the user can obtain a complete kit of home workshop power tools and accessories. One is to buy the drill and follow with selected pieces of equipment, as they are required; the other is to invest in a complete kit. In the latter instance there is some saving in cost, and hire purchase facilities are available. The Black and Decker Home Workshop Kit includes the following:

D500 Drill complete with 3-jaw precision geared chuck and chuck key.

5 in. portable saw attachment.
5 in. portable saw table.
Finishing sander attachment (orbital) complete with sponge rubber pad, 6 sheets of abrasive paper, polish cloth.
Horizontal stand.
Buffing and polishing kit.
3 in. wire cup brush.
5 in. moulded rubber pad (with clamp washer and a screw)—$\frac{1}{4}$ in. threaded shank.
Four open grain sanding discs (extra coarse, coarse, medium, fine).
Paint mixer.
3 twist drills, 3 wood auger bits, No. 8 masonry drill.

The complete workshop kit includes just about everything you need to start off with. The list of Black and Decker attachments and accessories is as follows.

D.7638 Lathe—This woodturning lathe has a rigid vibrationless base which can be screwed down to the bench. It has a full size tool rest, face plate, egg cup turning attachment and sliding head and tail stocks. The head stock is reversible for use as a horizontal stand. The face plate can be used with the vertical stand for sharpening and honing.

SPECIFICATION

Height of centres above bed: 3 in.
Maximum diameter for work turned between centres: $2\frac{5}{8}$ in.
Maximum work length between centres 12 in.
Maximum diameter work on face plate 5 in.
Overall length 24 in.

For longer work another bed can be screwed to bench to increase distance between centres to 36 in.

D.7870 Lathe Saw Table—a fixed saw bench for mounting on the lathe. The 5 in. Combination Blade supplied cuts to a depth of 1¼ in. and up to a width of 9 in. with rip fence adjustment. An automatic blade guard ensures safety.

D.8001 Lathe Saw Table Stand.—This is screwed to a work bench and enables the lathe saw table to be used without the lathe, the power unit being mounted in a U.2302 horizontal stand.

U.2302 Horizontal Stand—an essential but inexpensive accessory which holds the drill in a fixed position for grinding, buffing, wire brushing, etc., leaving both hands free to manipulate the work.

U.2300 ¼ in. Bench Stand—adapts the portable drill for accurate bench drilling. The tool bracket is adjustable and can be swung radially to any position.

U.1005 Disc Sanding Table Attachment—clips to the horizontal stand or lathe head stock for accurate fixed sanding of flat surfaces, angles or curves. Sanding discs are easily fixed to the metal sanding plate with cement provided and may be quickly changed. Attachment comprises 5 in. metal sanding plate, table, three assorted sanding discs, mitre gauge and tube of Disc Cement.

D.8661 Jig Saw Attachment—makes curved, straight or irregular cuts in a variety of materials and is excellent for cutting out difficult patterns or for sawing in places inaccessible to ordinary tools. A pivot pin allows the cutting of perfect circles from 2 in. to 15 in. diameter. Automatic bellows keeps the cutting line free from sawdust. Supplied complete with 1 Medium Wood Cutting Blade and 1 fine Ferrous Metal Cutting Blade. Other blades including knife for paper, rubber etc. are available.

D.7876 5 in. Portable Saw Attachment—quickly converts the drill to a portable saw with a depth of cut of 1¼ in. at 90°. The blade can be adjusted at angles up to 45° giving a depth

cut of $1\frac{1}{8}$ in. Fitted with a rip fence for accurate cutting of widths up to $3\frac{1}{4}$ in. or by reversing rip fence widths of $3\frac{1}{4}$ in. to $5\frac{3}{4}$ in. Supplied complete with Combination Blade.

D.8011 5 in. Portable Saw Table—This accessory enables the portable saw attachment to be used as a fixed bench saw. It is fitted into a recess easily cut in your workbench and the saw attachment is securely held in position beneath it by a quick release spring clip.

Right Angle Speed Changer—This ingenious attachment, the only one of its kind—has two purposes. (1) It helps you to drill, sand or polish in the most awkward places with ease. (2) It enables you to double or halve the normal speed of the drill and so do a better job. You use the FAST speed for quick drilling in light alloys and for high speed sanding. The SLOW speed is particularly useful for drilling in ceramics, masonry, glass, tile, brick, concrete etc.

D.8556 Floor Polisher Attachment—a labour saving Floor Polisher Attachment, twin revolving brushes work the polish into the floor, then you clip on a couple of lambswool pads for shining.

U.1220—a 3 in. wire brush cup shaped.

D.8118 Finishing Sander Attachment — must be operated with the drill at minimum speed of 2,000 r.p.m.

U.1509 Paint Mixer—Take a D.500, add the above attachments and take the hard work out of home decorating. The Finishing Sander Attachment is used for rubbing down paintwork. It gives a fine flat finish. Supplied complete with six sheets of abrasive paper, polish cloth, and sponge rubber pad. The Wire Cup Brush is used for derusting metal window frames, gutters etc. The paint mixer attachment will mix paint thoroughly and quickly.

U.1300 Moulded Rubber Pad—sanding discs are attached to the Moulded Rubber pad, and are used for smoothing down made-good cracks in plaster or woodwork.

Black and Decker Home Builder Tool Chest—is an up-to-date tool kit, containing both electric and hand tools. All the essential tools for maintenance, repair and construction housed in a strong wooden chest. The contents are as follows:

D.500 $\frac{1}{4}$ in. Electric Drill
D.8011 Portable Saw Table
U.1220 Wire Brush Cup
D.7876 Portable Saw Attachment
U.1400 Metal Sanding & Sharpening Plate
U.2300 Vertical Bench Drill Stand
U.1409 Pkt. extra coarse Sanding Disc
D.8382 25 ft. Drum of Cable
U.1300 Moulded Rubber Pad
U.1509 Paint Mixer
D.8670 No. 8 Masonry Drill
D.8672 No. 12 Masonry Drill
6 in. Rabone Set Square
U.1411 Pkt. Medium Sanding Discs
D.8118 Finishing Sander Attachment
U.2198 Tube of Disc Cement
U.2302 Horizontal Stand
Pair 6 in. Insulated Pliers
24 in. Rabone Boxwood Folding Rule
Two Plastic Handled Electricians Screwdrivers
9 in. Rabone Spirit Level
Three Wood Augers $\frac{1}{4}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in.
Four Speed Steel Twist Drills 1/16 in., $\frac{1}{4}$ in., 3/16 in., $\frac{3}{8}$ in.

There is also a full range of accessories and replacement items.

APPENDIX—B

THE BRIDGES ATTACHMENTS AND ACCESSORIES

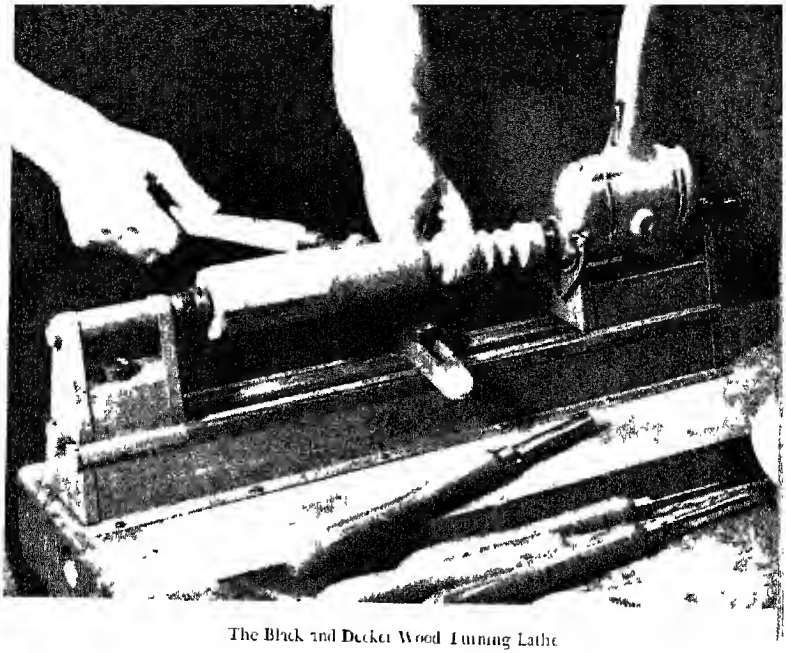
The full range of Bridges Power Tools is much too extensive to list in full. The Bridges Neonic DR2T has been described in the instruction sections of this book. Another unit which may come within the scope of home user interest is the Bridges $\frac{3}{8}$ in. General Purpose Drill, although this is really an industrial model. The specification is as follows: $\frac{3}{8}$ in. geared chuck capacity, $\frac{3}{8}$ in. drilling capacity (steel), $\frac{3}{4}$ in. drilling capacity (hardwood), 500 r.p.m (full load) spindle speed, 900 r.p.m. (running light) spindle speed, nett weight 5 lbs. all voltages. One very interesting feature of this robust power tool is its availability with different types of handles—saw handle, pistol handle, or side-grip handle.

Included in the range of industrial and heavy-duty power tools is a 7 in. Bench Grinder, High Speed Portable Grinder, a Portable Chain Mortiser, a Portable Electric Router, a Belt Sander and Orbital Sander.

The Bridges list also includes the Multi-purpose Woodworker which may be used for routing, grooving, jigcutting, shaping and spindle moulding.

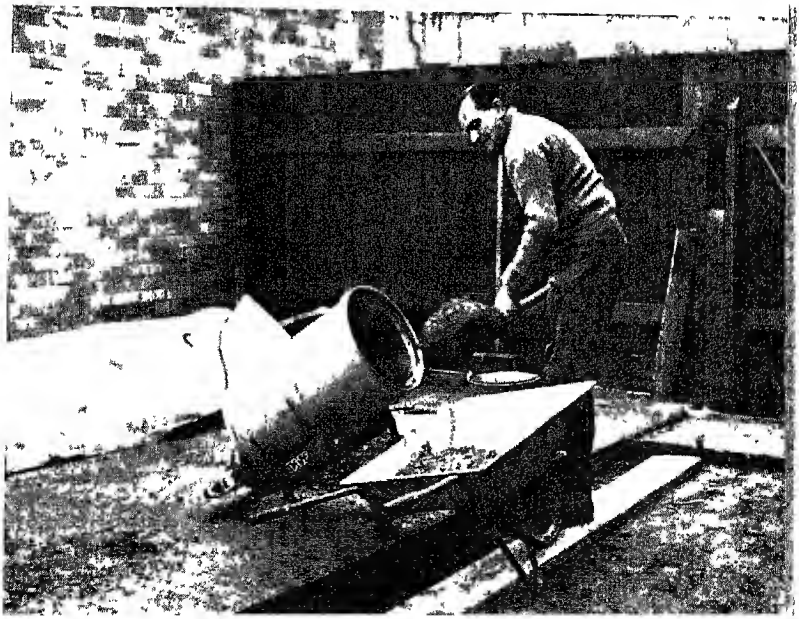
Another interesting item of Bridges home-user equipment is a Multi-purpose Saw Table. This is a very strong table which (with its power unit and attachments) may be used for Jigcutting, Spindle Moulding, Cross Cutting, Rip Sawing, Dovetailing, Mortising, Simple or Compound Mitreing. Table-top area is 21 in. by 14 in.

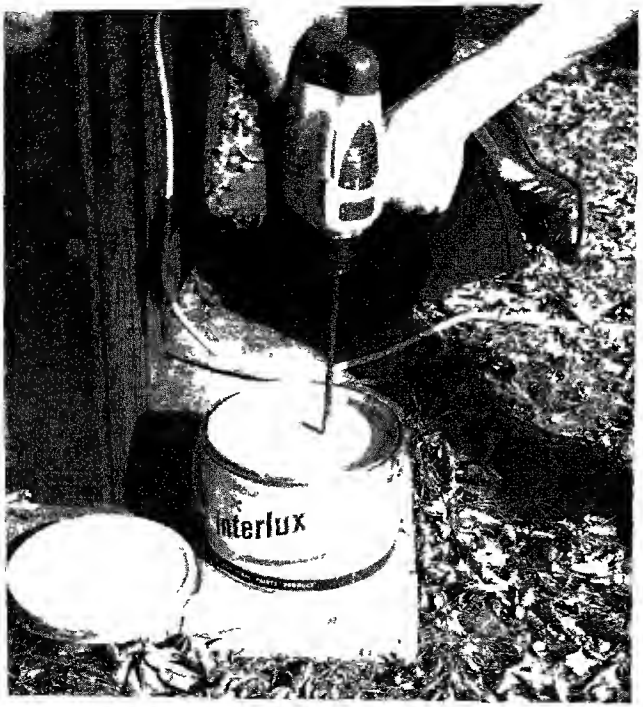
Bridges have an Interchangeable Kit Plan. This equipment has been designed for complete adaptability and versatility. With this equipment the user can build up a complete home power workshop around one basic kit by the addition of a minimum of extra parts, and without buying a single item twice. For example, the addition of only three items converts



The Black and Decker Wood Turning Lathe

The Wolf Rotamix Cement Mixer in use





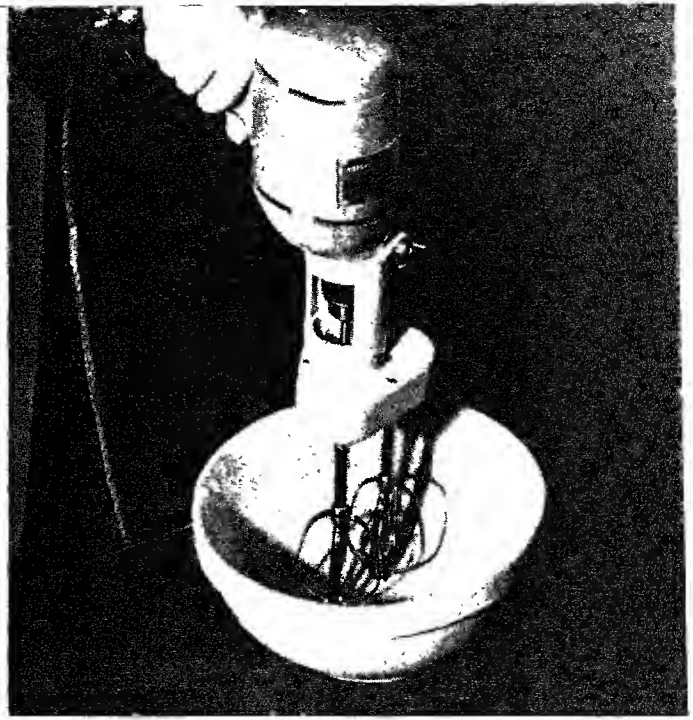
The Wolf Salerymaster *with Paint Mixing Attachment*

The Bridges Neonic Drill fitted with Paint Spraying Equipment

The Bridges Nu Shears hedge trimming and pruning attachment

Using the Wolf Soil Cultivator

The Black and Decker Floor Polishing Attachment



Bridges Nu Mixer Attachment

the 6 in. bench saw into a 6 in. bench sander; the addition of only two items converts the 22 in. lathe into a drilling machine.

There are several Home Workshop Kits—the Z10 kit includes the accessories listed below:

TPL1/SA	Bench Stand Assembly
TPL3/SA	Saw/Sander Arms Assembly
TPL5/SA	Saw/Sander Table Assembly
TPL7/SA	Hinged Tailstock Assembly
TPL9/SA	Tool Rest Holder Assembly
TPL10/SA	Tool Rest Assembly
TPL14	Driving Centre
TPL18	Back Centre
TPL16/SA	Spring Lever Assembly
TPL19	6 in. Face Plate
TPL28	Lathe Bars Bridge
TPL30	Lathe Bed Bars (Cotters and wing nuts)
TPL31	6 in. Sanding Plate
TPL42	Saw Mandrel Assembly
TP44/SA	Saw Guard Assembly
TPL55	Universal Spanner
TPK1/SA	Paint Stirrer
TPK3	6 in. Rubber Backing Pad with cup washer
TPK4/SA	Adaptor Assembly
TPK5/SA	Side Handle Assembly
FPA1	Extension Handle Bracket
FPA3/ FPA4	Extension Handle
J111/13	Wobble Washers
STD301/S	6 6-in. Sanding Discs without hole
STD/S	6 6-in. Sanding Discs with hole
STD319/S	6 6-in. Sanding Discs with hole (metal)
STD303	4 in. Wire Brush
STD304	4 in. Polishing Buff
STD305	4 in. Grinding Wheel
STD306	6 in. Lambswool Bonnet
STD307	6 in. Felt Pad

STD308	H.S.S. Twist Drills—set of four
STD309	Polishing Compound
STD311	Disc Cement
STD313	6 in. Saw
STD354	Extension Chuck Key

Extra Bridges attachments and accessories are as follows:

Nu-Saw Jig-Saw Attachment (*Ref. NJS*) for straight or contour cutting of wood, metal, plastics etc. Maximum cutting capacities—1½ in. in softwoods, 1 in. in hardwoods, and ⅛ in. in metal.

Nu-Rip Circular Saw Attachment (*Ref. NRS*) gives a 1½ in. depth of cut. Bevel adjustment up to 45° angle. Supplied with Special Nu-Rip blade.

Nu-Shears Hedge Trimmer Attachment (*Ref. AS*). When used with Bridges Neonic Drill this fitment cuts twigs up to ½ in. diameter without "clipper bruising."

Nu-Sander Attachment (*Ref. AS*). An oscillating sanding fitment for attaching to the Neonic Drill to impart a smooth finish to wood, metal, plastics etc. Sanding Area 7½ in. by 3½ in. Speed: 2950 movements per minute.

Chisel Mortising Attachment (*Ref. TPL32*). For use in conjunction with Complete Home Workshop Drilling Machine. Chisels and drilling bits are extras.

Comb Joint Attachment (*Ref. CJ1*). For quick and easy angle or spliced joints in timber, plywood, hardboard or plastics. It will comb any width of material up to 1 in. thick.

Flexible Shaft Kit (*Ref. FSK*). Portable strong and well constructed, the flexible shaft extends the range of your equipment. Contents: 4 in. flexible Shaft, Rotary cutter, Mounted point, 3 in. Rubber backing pad, 1 in. Rubber backing pad, 2 1-in. Garnet Discs, 2 1-in. Emery Discs, 2 3-in. Garnet Discs, 2 3-in. Emery Discs, and a tube of Adhesive.

Nu-Mixer Attachment (*Ref. NM*). A food mixing attach-

ment for use with Neonic Drill. Will mix foods of any consistency.

Nu-Gear Two-Speed Gear Box Attachment (*Ref. TPL32*). This attachment gives finger tip selection of two speeds of 2950 r.p.m. and 740 r.p.m. thus enabling the efficient drilling of most materials.

Mitreing Attachment (*Ref. TPK11*). Attached to the Bench Saw this enables cuts to be mitred at any angle between 0° and 90°. With the attachment fitted to the sander the timber can be finished to within the same degree of accuracy.

Cable Dispenser (*Ref. STD528*). A rotary drum and stand for using drill at a distance from a power point. Holds 50 yards of 3-core cable. Complete with 3-point plug and socket.

Abrasive Kit (*Ref. TPK10*). A most useful kit for use in Bench Stand, Drill or Flexible Shaft for intricate jobs.

Tool Grinding Table (*Ref. TPL69*). A calibrated table assembly enabling you to grind accurately, twist drills, tools etc.

18 S.W.G. Shear Attachment (*Ref. J.*). This is an attachment that will be of particular interest to Home Workshop enthusiasts who have a bias towards metalworking. Attached to a Bridges Neonic Drill or to other makes of $\frac{1}{4}$ in. portable electric drills it will shear metal up to 18 s.w.g. cleanly and efficiently.

Mortise and Tenon Attachments. Here's a set of attachments that will enable you to tackle the mortise and tenon joint quickly and accurately.

Grass Cutter Attachment. A precision made 12 in. grass cutter, powered by your electric drill, with knife edge steel rotating blades that cut the grass cleanly and quickly.

Home Workshop Folding Bench. This folding bench is ideal for use in the home or small workshop. When not in use it can be folded flat.

Ideal Home Kit (*f*). Contains everything you need for drilling, polishing, sanding, rust removing, paint mixing etc. Contents: Noenic Drill, Chuck Spanner, Paint Stripper, Rubber Backing Pad with Cup Washer, Side Handle Assembly, Lambswool Bonnet, set of four Twist Drills, Extension Chuck Key, $3\frac{1}{2}$ in. Wire Cup Brush, 12 Discs for Metal (4 each grit), 12 Sanding Discs (4 each grit), Universal Spanner, Extension Lead, Carbide Tipped Drill, Adaptor Assembly.

Rotary Hoe Attachment. Put an end to continual hoeing and tilling. The Bridges Rotary Hoe Attachment is precision made, light in weight with 12 Rotary blades that break up the earth speedily and thoroughly.

Floor Polisher Attachment. Light to handle, the twin spinning brushes do all the work, then the lambswool pads put on the final shine.

APPENDIX—C

SELECTA HOME WORKSHOP EQUIPMENT

In the Selecta range, the tool of chief interest to the home user is the Selectamatic which has been described in the instructional sections of this book. The Selecta people also make a $\frac{1}{4}$ in. drill of robust appearance and performance. The main specification is as follows: Drilling capacity (steel) $\frac{1}{4}$ in., drilling capacity (hardwood) $\frac{3}{8}$ in., no-load spindle speed 2,400 r.p m., supplied with 3-jaw drill chuck and key, 3 yards triple core cable, spare set of carbon brushes and maintenance instructions.

The Selecta range of purpose power tools includes a Portaplane (electric planer), Tool Post Grinder, a wide variety of Grinding Machines, the Keensaw (electric power saw), several kinds of industrial and heavy-duty drills, a Metal Shear and Hyespeed Portable Grinder.

There are several Selecta ranges of combination equipment for different classes of work. For example, the Shopmaster Combination Woodworker is designed for the industrial woodwork shop. The Selecta Benchmaster, and the Home-master combination groups are of interest to the home power tooler.

Another Selecta workshop group is the Unimat which is a universal metal workshop. This is a small combination machine which can be converted easily from lathe into drill press, jig saw, circular saw, milling machine, tool grinding machine, grinding and polishing machine, threading machine, dividing machine, and portable drill. It is intended for the home user and for model makers, but is well suited as a complementary workshop unit for opticians, instrument makers, bicycle and power cycle repairmen and other professional small users.

The Selecta Benchmaster Home Workshop equipment is intended for the really serious home craftsman. The equipment is built on very robust lines and may be quickly converted for use as a bench saw, bench sander, bench grinder, router, jig saw, drum sander, spindle moulder and for drilling and lathework. There is a very full range of conversion sets and basic units.

The Selecta Home-Master Workshop is designed for use with any popular $\frac{1}{4}$ in. drill. It is a very sturdy piece of group-combination equipment which may be set up quickly for a very wide range of power tool purposes, including the following:

Mitreing	Cross-cutting
Ripsawing	Compound Angle Drilling
Grooving	End Routing
Undercutting	Drilling
Compound Mitreing	Scarfing
Portable Sawing	Mortising
Routing	Cutting Large Sheets

There is also a good range of Selecta Home-Master attachments designed to increase the scope of the Home-Master Workshop, including the following:

104 Jigsawing Attachment with double shield bearings proof against dust build-up. The jigsawing attachment is essential for cutting curved or irregular shapes.

224 Planing Attachment. Speedy and accurate for precision planing, rotary blades and floating drive connection. Will plane up to 6 in. width wood by repeated passes.

307 Lathe Turning Attachment. Very quick and will give a fine finish. Easily converted to and from lathe work, 30 in.

between centres and 7 in. swing, supplied complete with driving centre.

515 Universal Spindle Moulder. This attachment is the only one of its type on the market, will produce a variety of edges, beads, and moulds.

705 Copying Attachment. A simple device for reproducing accurately all sorts of involute shapes internally and externally from a single master. Fully reversible four-dimension type router anvils made from special alloy Nickel Chrome, steel.

808 Box Combing Attachment. Converts any circular saw into a fast repetitive box combing machine. Fully patented and free from any possibility of distortion. Its indexing is automatic, no marking out is necessary, width of comb is easily adjusted.

814 Dovetailing Attachment. The use of the dovetailing attachment will ensure a strong neat accurately fitting joint. No marking is necessary, the joints are self-positioning, and of such a good fit that glueing is not essential.

909 Horizontal and Vertical Belt Sander operates in both the horizontal and vertical planes. An adjustable and removable fence is provided for passing work to and against the belt sander whilst in operation.

941 Flexible Drum Sanding Attachment enables complicated curved shapes to be accurately sanded. It operates on the principle of a revolving block with specially prepared rubber sides which give to the shape presented against it.

There is also a group of gardening attachments for use with the Selectamatic Drill as follows:

Rotary Hoe-digger Attachment. An efficient tool, light in weight but powerful. Turns earth very quickly. A built-in gear unit reduces the drill speed (2,500 r.p.m.) to 620 r.p.m.

Hedge-Trimmer and Saw Attachment. Cuts twigs up to $\frac{1}{2}$ in. diameter on one side of blade; other side is fitted with a removable saw for cutting through larger thicknesses.

Grass Cutter Attachment. This works on the rotary-blade cutting principle. The Selecta Mower can be powered by the Selectamatic Drill, or by a two-stroke petrol engine.

APPENDIX—D

THE WOLF RANGE OF HOME POWER EQUIPMENT

Wolf Electric Tools Ltd. market two power tools for the home user.

1. *The Safetymaster Power Unit* which is described in Section Three.
2. *The Cubmaster* $\frac{1}{4}$ in. Electric Drill, which was introduced quite recently to supersede the famous Wolf Cub, the first of the home power tools to be marketed in this country some ten years ago. The Cubmaster has a $\frac{1}{4}$ in. precision chuck.

SPECIFICATION

Supplied complete with built-in TV suppressor, $\frac{1}{4}$ in. key type chuck, chuck key and 5 ft. of three-core T.R.S. cable one lead for earthing). Radio suppressor available. Supplied for operation on 100/110, 110/130, 150/160, 200/220, 220/250 volts D.C. and single phase A.C. 25/60 cycles. (Also available for 32 and 50 volts to special order.)

Drilling capacity—	
in mild steel	$\frac{1}{4}$ in.
in hardwood	$\frac{1}{2}$ in.
Watts input on full load	250 watts
Spindle speed running light	3,000 r.p.m.
Spindle speed on full load	1,900 r.p.m.
Overall length	$7\frac{5}{8}$ in.
Nett weight	3 lbs.

Wolf market a very wide range of attachments for use with the Safetymaster and Cubmaster. Whilst many of the attachments can be used with either of the machines there is a range of large capacity bench workshop equipment for the Safety-

master and a similar slightly smaller range for use with the Cubmaster.

Both machines meet British Standards specifications and in the case of the Safetymaster this also conforms with the International Double Insulation Standard and has been fully approved by The British Safety Council. In addition both machines have been approved by The Council of Industrial Design and are on permanent show at the Design Centre in London.

Most new owners of power tools start by buying the actual tool together with a sanding and polishing set or a drilling, grinding and buffing set—these are two sets which cover a multitude of jobs and enable the new user to obtain experience in the handling of his new acquisition which after all is only slighlly less powerful than the power tools used in industry.

Properly handled the power tool and the above mentioned attachments make it possible to embark on ambitious jobs which would have hitherto taken too much time and even if undertaken results would not have been to professional standards. Also the speed and professional finish ensure that the jobs themselves are a real source of pleasure without the drudgery that the non-power handyman has to endure.

The following brief notes will give the reader some indication of the wide range of attachments available starting with the portable sets.

The Drilling, Grinding and Buffing Set is ideal for drilling in metal, wood etc. and grinding, buffing, burnishing and de-rusting of metal-work etc. Also very useful for decarbonising engine parts. The Wolf No. 103 set, for use with the Safetymaster, comprises seven high-speed steel twist drills, 4 in. wire brush and arbor, 1½ in. cup wire brush, 3 in. surface bristle polishing brush and arbor. Wolf No. 3 set which has a similar range of components but of a slightly smaller size is intended for use with the Cubmaster.

The Jig Saw Attachment is an extremely useful attachment which can be used with either of the Wolf power units and will be found ideal for cutting in wood, hardboard, plastics etc. It will clean cut at high speed straight lines or complicated shapes. A useful feature is the fact that it can be adjusted up to 45° for bevel cutting. The cutting capacity for wood is 1½ in. and in steel, Formica, etc. 1/16 in.

The Paint and Varnish Remover is a low-priced but very useful attachment. It is a quick, easy, and economical way of removing paint and varnish from wood or hardboard. It can be used indefinitely without any great deterioration and includes a cooling fan.

The Portable Saw and Groover is probably one of the most useful handyman attachments, and can be used for cutting a multitude of materials about the house and in the garden. An added feature of the Wolf attachments is that they can also be used for grooving. (See Fig. 11.)

Wolf No. 112, 6 in. saw for use with Safetymaster.
Maximum depth of the cut at 90°, 1 11/16 in.
Maximum depth of the cut at 45°, 1⅜ in.
Maximum width of groove (in one cut), ⅜ in. to depth ⅜ in.
Wolf No. 12, 5 in. saw, for use with the Cubmaster.
Maximum depth of cut at 90°, 1¼ in.
Maximum depth of cut at 45°, 1 5/32 in.
Maximum cutting width of grooves ⅜ in. to depth ⅜ in.

The Universal Table Set enables the conversion of the above saws to bench units. Wolf market a Saw Table which can be mounted on the side of a workshop bench and by merely screwing the sole plate of the saw to the base of this unit a Bench Saw is formed. The No. 117 Table can be used with either the No. 12 or No. 112 Saw.

The Wolf Orbital Sanding Supasander is an ideal portable sanding tool for flatting before polishing or painting and it

gives a perfectly flat and smooth surface. Results will be extremely gratifying and will produce a really professional finish after just a few minutes' practice. It can be used with either of the Wolf power units.

The normal running speed of power tools is considered to be a little too high for masonry drilling and for large capacity wood drilling. By attaching the *No. 27 Lo-speed gear* to the nose of either machine the unit has a 4:1 reduction ratio and can be used for large diameter drilling of timber, plastics, metal, etc. It is also advisable to use this reduction gear when using a polishing mop on cars, furniture etc.

The floor polishing attachment is a lightweight unit for floor and furniture polishing, which merely requires the addition of either power unit. It has two 5 in. diameter brushes and is supplied complete with two indestructible nylon-fur polishing pads which can be washed repeatedly without deterioration.

Powered Garden Attachments will be found to save hours of laborious uninteresting work. Most popular of all power tool attachments for the garden is the Wolf Hedgetrimmer No. 14. The Wolf unit is a specially designed lightweight model which can be used for a considerable length of time without fatigue. The tool will be found ideal for trimming or hard cutting back on hedges and it will give a true secateur cut and save much laborious work. Wolf also market a special clippings bag which when fitted to the trimmer collects more than 90 per cent. of the clippings.

The Wolf Cultivator and Weeder Set No. 118 makes light work of furrowing, hoeing, earthing-up, working-in fertilisers, etc. It is easily attached to the power unit and is really built to last with steel hardened gears, bearings and stainless steel tines.

The Wolf Safetymaster Supa-power range of bench equipment is amongst the largest and most robust available to the handyman at the present time. A great advantage of this par-

ticular range is that it can be progressively built up as and when the purchaser can afford to add particular sets.

The Bench Clamp Type SPC converts the Safetymaster into a bench work head for drilling, grinding, buffing, polishing etc. and forms the headstock for the bench drill and acts as the power unit cradle for bench sawing, sanding, comb jointing, woodturning etc.

By adding the SPC Bench Clamp to the Drill Stand Base Set No. 101, a precision bench drill stand is ready made. By releasing a quick-lock lever the headstock and pillar can be accurately located between 0° and 90° for angle drilling. This also allows instant conversion for woodturning. Angular movement of the pillar is 0° to 90°, depth of feed is 2½ in., maximum distance from chuck to base is 28 in.

The addition of the Lathe Set No. 104 to the bench drill assembly forms a heavy-duty woodturning lathe which turns wood up to 24½ in. long by 4 in. diameter between centres, and face plate, work up to 6 in. diameter. The back centre support has a 1¼ in. movement and a special feature is the "live" centre, ensuring free running and complete accuracy.

For high-speed sanding of wood, metal, plastic, etc. a 6 in. Bench Sanding Set No. 109 is ideal. The table can be set at angles up to 45° and a mitre attachment can be adjusted from 0° to 90°—it can be used in two positions on the table depending upon the size of the work. The sander table can also be used as an extension for the bench saw table to facilitate working with large area materials such as hardboard, plywood, etc.

The robust 6 in. Bench Saw Set No. 105 has a maximum cutting depth of 1 11/16 in. and an angle adjustment of up to 45° for mitre cutting. The SPC Bench Clamp is used with this set. A straight edge spans the complete width of the large area table and is hinged for quick removal when not required —locking at both ends ensures complete rigidity in use. The

aperture in the saw table can be varied in width by means of an adjustable plate to ensure perfect safety when cutting narrow pieces of timber. A spring-loaded telescopic safety guard is also fitted.

Grooving Blade No. 13655 is a special 4 in. diameter by 3/16 in. blade for quick and accurate cutting of grooves, rebating, etc. It is also possible to cut any width by making multiple cuts to a maximum depth of 11/16 in.

Other Supa-Power attachments include fretsaw, comb jointer, flexible shaft set, boot and shoe repair set.

A complete range of bench attachments for the Cubmaster is available, in line with the above mentioned for the Safetymaster, but all of a slightly smaller size. The range can be built up progressively in a similar manner, and includes a bench drill stand base set, lathe, bench saw, bench sander, bench planer.

For those who prefer to buy complete kits, Wolf market two kits covering the Safetymaster equipment, and three kits covering the Cubmaster equipment. The smaller kits include the more popular handyman attachments, and are ideal to start off with. They can all be obtained on easy terms from most retailers.

The Revo Jobber

EARLIER in this book I mentioned the necessity of obtaining current lists from power tool dealers before planning a power tool workshop, or before ordering new accessories and attachments. The wisdom of that suggestion is hereby established; after completing the manuscript of this book, and posting it off to the publishers, a completely new power tool outfit was put on the market. This is the *Revo* Jobber, and details of the basic unit and workshop equipment can be obtained from local suppliers. The following information is of necessity brief. In the author's opinion this new power tool should quickly establish itself as a worthwhile addition to the home workshop.

THE *REVO* JOBBER

Drilling capacity (steel) 5/16 in.
Drilling capacity (hardwood) $\frac{3}{4}$ in.
Chuck speed (fully loaded) 2,100 r.p.m.
Chuck speed (no load) 3,300 r.p.m.
Overall length 8 in.
Nett weight $4\frac{1}{2}$ lb. (approx.).
200/220 volts and 230/250 volts AC/DC.
Rating 350 watts.
Radio and TV suppressed.

The *Revo* Jobber is a good-looking tool of rugged construction. It has a built-in spirit level, is well finished and feels right in the hand. It forms the basic power unit of a complete home workshop. A series of " packs " is obtainable for converting the tool for a wide variety of purposes.

The Basic Pack is the tool itself, with chuck-key, a special spanner, gripping handle and full instructions for use and maintenance. This is followed by packs Two, Three, Four and Five which provide conversion equipment for drilling—including a bench-holder which may be used for other purposes, such as grinding and wire brushing, etc. The bench holder is also used with other packs.

Packs Six, Seven, Eleven and Twelve include all fitments and parts for conversion into a sturdy lathe.

Packs Eight, Nine and Ten provide a saw table, circular saw and a sander. All these parts are of robust construction and are designed for maximum efficiency.

Packs Thirteen to Eighteen provide all the additional equipment required by the power-tooler. There is a sturdy baseboard which forms the top of a storage cabinet for all the equipment and fittings. There is a grinding and buffing pack which consists of all the necessary items for maintaining and sharpening tools, removing rust, polishing metal surfaces, etc. There is a separate polishing and sanding pack, a foot control switch and an extension cable.

The motor of the *Revo* Jobber is of the capsule type. Cooling is obtained by a twenty-four blade fan which is mounted on the armature shaft giving the drill continuous rating. Single reduction helical gears are used, running packed in grease. Control is by a trigger switch which can be locked in the " on " position.